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# **Perceptual Performance and the Effective Person**

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By Richard S. Crutchfield, Donald G. Woodworth  
and Ruth E. Albrecht

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## PERCEPTUAL PERFORMANCE AND THE EFFECTIVE PERSON

By  
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Project 7730, Task 77353  
Contract AF 18(600)-8

PERSONNEL LABORATORY  
WRIGHT AIR DEVELOPMENT CENTER  
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UNITED STATES AIR FORCE  
Lackland Air Force Base, Texas

## Foreword

The over-all objective of the research conducted under contract with the Institute of Personality Assessment and Research at the University of California at Berkeley was the development and validation of a program to assess and predict potential effectiveness of Air Force officers. This research resulted in the development and application of a preliminary, experimental assessment program which was administered in two phases to a group of Air Force captains. The two phases were a field-testing phase and a living-in assessment phase.

The 343 captains participating in the field-testing phase were given 27 paper-and-pencil tests which were administered to the officers at their home bases. These tests may be classified into the following areas: (a) biographical data, (b) tests of personality and interests, (c) tests of cognitive and intellectual functions, and (d) tests of social insight and judgment.

Of the field-tested officers, 100 were selected to participate in the living-in assessment phase; they were assigned on temporary duty to the Institute of Personality Assessment and Research at the University of California, in groups of 10, for a period of three days. During this period they entered into approximately 50 assessment procedures including interviews, individual tests, tests of interpersonal and group behavior, and physiological tests. Further, a staff of psychologists rated each officer on 30 personality variables considered relevant for effectiveness in senior command and staff assignments.

As part of the evaluation of the assessment data, effectiveness measures were obtained from various sources as criteria. Officer Effectiveness Reports, promotion board ratings, and superiors' ratings were included as well as evaluations by experts (Contract AF 18(600)-420 with Western Reserve University).

The scope of this project required that many organizations and individuals participate both in providing information to IPAR and in the official monitoring of the Air Force project. These are credited in detail in the preface to the comprehensive report. A survey of the work accomplished under the IPAR contract and the major research findings are presented in a five-part WADC Technical Report under the general title, *An Assessment Study of Air Force Officers*.

In addition to the comprehensive report, a number of detailed and discrete studies emerged. Some of these have appeared in various scientific journals. This Technical Note is one of several such independent studies which appear in the AFPTRC and WADC publication series.

#### ABSTRACT

The Institute of Personality Assessment and Research carried out an extensive psychological assessment of a group of 100 Air Force captains in order to develop a set of procedures which would identify those officers most likely to be effective in command and staff positions. This particular study presents data collected from 10 perceptual tests included in the program. Developmental material is presented for some of the tests. The purpose of this report is to show the potential contribution of such perceptual behavior to the assessment and understanding of personality. Stress is upon the perceptual performance of the military officer rated effective. Results indicate that the perceptual tests are most strongly related to the areas of intellect and cognitive flexibility. Numerous significant relationships were found with tests in the areas of emotional adjustment, social relations, and leadership. The specific nature and direction of the relationships between perceptual and personality measures are consistent with the assumption that basic personality trends are general in nature and should manifest themselves in analogous ways in perceptual and other forms of behavior.

#### PUBLICATION REVIEW

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## Summary

A. **Problem:** All officers will not benefit equally from training and education nor will they develop into top command and staff officers. It is, therefore, of the greatest importance to be able to identify those officers who should become the Air Force leaders of the future. The Institute of Personality Assessment and Research carried out an extensive psychological assessment of a group of 100 Air Force captains selected from the total sample of captains within Air Training Command who were eligible for promotion. The purpose of the assessment program was to develop a set of psychological evaluative procedures which would identify those officers who were most effective in their jobs. The pertinence of perceptual performance to personality assessment is in discovering how individual differences may relate to various personality dimensions, in order to help in the psychological understanding of these dimensions, and in turn to investigate the means of developing predictive instruments for them. The purpose of the present study was to explore the potential contribution of a number of perceptual procedures to the assessment and understanding of personality. In particular, this being a study of the determinants of superior functioning in military officers, the stress is upon the perceptual performance of the effective person.

B. **Method:** Each of the following 10 perceptual-cognitive tests were administered to the subjects under standardized laboratory conditions: Size-Weight Illusion, Weight Judgment, Progressive Squares, Perception of the Vertical, Line Movement, Periscopic Tracing, Tapping, Kinesthetic After-Effect, Street Gestalt, and Gottschaldt Figures. Four of the tests were created and developed for this study. For each of the tests the same type of analysis was made. The 100 officers were scored on one or more measures derived from each test. These measures were systematically correlated with all of the more than 600 other scores obtained in the assessment pertaining to psychological areas such as intellect, interests, emotional adjustment, social relations, personality structure, and life history. Each perceptual measure was also compared with certain Air Force criterion measures of military effectiveness of the officers. The two extreme performance groups for each perceptual measure were compared in terms of variables correlating significantly with that measure.

C. **Conclusions:** In general, the findings establish that there are numerous and consistent relationships between perceptual performance and the personality characteristics and behavior of the individual. The specific nature and direction of the "perception-personality" relationships tended to correspond with what would be expected on the assumption that basic personality trends are general in nature and should manifest themselves in an analogous manner in perceptual and other forms of behavior. Thus, a perceptual performance which revealed susceptibility to illusion was found to be associated with a more general trait of suggestibility as measured in quite different ways. Again, performance on those perceptual tasks which particularly emphasized successful task achievement was found to be associated with superior achievement by the individual in other aspects of behavior. Several of the perceptual tests had significant correlations of moderate size with independent criteria of Air Force officer effectiveness, e.g., Promotion Board Ratings. Virtually all of the perceptual tests were found to contribute in some manner to the measurement of those general traits of the effective and superior person that are demanded in the military officer.

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D. Recommendations: It should be stressed that this kind of study simply prepares the empirical groundwork for a theoretical attack on the problem of relating perceptual functioning and personality. The study does clearly provide data that challenge theoretical inquiries. And the study would seem clearly to establish the fruitfulness of the inclusion of perceptual tests in the assessment of personality and effective functioning of the individual.

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# PERCEPTUAL PERFORMANCE AND THE EFFECTIVE PERSON\*

## INTRODUCTION

The study of perceptual performance as part of the systematic assessment of persons is important both for theoretical and for practical reasons. In its very nature perceptual performance constitutes a critical aspect of the whole behavior of the individual--the ways in which he is sensitive to, interprets, and copes with objective features of his environment. Lacking knowledge of the individual's characteristic manner of perceiving, we have an incomplete picture of his personality. Moreover, perceptual performance is more easily elicited, observed, and quantified than many other forms of behavior with which it is correlated, and hence may be a convenient means of measuring underlying associated traits.

For these reasons perceptual tests fulfill an important role in the assessment of personality. They have begun to come into widespread use, and there has grown up a substantial research literature on "perception-personality" relationships. Nevertheless, it seems safe to say that relatively little is yet firmly established about this highly complex problem. For one thing, it appears that the essential complexity of the relationships involved has often been underestimated, and this has led to an unfounded hope that close and universal correspondences could be established between some simple aspects of perception and some basic dimensions of personality. For another thing, there has been a certain amount of conceptual vagueness as to the distinction between underlying perceptual processes and manifest perceptual performance. Finally, there have been few opportunities to study perceptual performance systematically in the context of a broad and representative assessment of the total personality.

A rare opportunity of this kind was offered in the spring of 1953 in the assessment of 100 Air Force captains at the Institute of Personality Assessment and Research as part of a study of the factors associated with effective functioning of officers. A battery of approximately 50 assessment procedures, including interviews, personality inventories, standard objective tests of personality and intelligence, group interaction situations, experimental tests, etc., yielded comparable scores for each of the men on more than 600 variables.<sup>1</sup>

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\*Manuscript released by the authors for publication in December 1957.

<sup>1</sup>Appendix A gives a complete list of the assessment procedures. A full description of all of the variables will be found in the report by MacKinnon and others (6).

Included among the procedures were a considerable number of perceptual tests.<sup>2</sup> They were not, of course, intended to represent a comprehensive sampling of all possible kinds of perceptual tasks likely to contribute significantly to personality assessment. The domain of perceptual functioning is immense and at best in such a study one can select tests in such a way as to get considerable variety among types of perceptual performances. The selection, as is true in this case, is likely to reflect the theoretical bias of the investigation.

It is probably safe to say that in no previous major personality assessment study has there been a comparably large use of perceptual performance tests, nor a comparable opportunity to determine the relationships of perceptual performance variables with such a manifold of personality measures from other domains.

This report treats of the following 10 perceptual tests:

- A. Size-Weight Illusion Test.
- B. Weight Judgment Test
- C. Progressive Squares Test
- D. Perception of Vertical Test
- E. Line Movement Test
- F. Periscopic Tracing Test
- G. Tapping Test
- H. Kinesthetic After-Effect Test
- I. Street Gestalt Test
- J. Gottschaldt Figures Test

These tests are partly borrowed, partly new. The Street Gestalt Test, the Kinesthetic After-Effect Test, and the Perception of Vertical Test are taken over from previous work of other investigators with only minor modifications to adapt them to the assessment setting. The Weight Judgment Test, the Line Movement Test, the Gottschaldt Figures Test, and the Progressive Squares Test have some ancestry in the work of other investigators, but they have been extensively modified for use here. The remaining tests--Size-Weight Illusion, Tapping, and Periscopic Tracing--have been newly created and developed for the present studies.

The tests vary in the kinds of perceptual performance involved. Some call for perceptual achievement, that is, the person seeks to make a correct

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<sup>2</sup>Joseph H. Handlon, Bela O. Baker, and Wallace B. Hall were of great service in helping in the administration of these tests.

response. This is true, for instance, of the **Street Gestalt Test**, in which the task is to identify correctly a fragmented figure; it is also true of the **Periscopic Tracing Test**, in which the person attempts to reproduce a stimulus as faithfully as possible, and of the **Size-Weight Illusion Test**, in which the task is to guess the correct weight of an object.

Others of the tests do not have this achievement aspect. For instance, the **Line Movement Test** is in part simply a measure of perceptual fluctuation. And the **Weight Judgment Test** requires the person to establish and to modify a subjective scale of judgments, for which there is, of course, no correct answer.

The term "perceptual" in reference to these procedures may not be entirely apposite. What is intended is a broad meaning of perception, more nearly equivalent to what some would call cognition. A very large judgmental element enters into all of these test performances. They are essentially measures of how the person makes difficult judgments about changing, complex, or inadequate stimuli.

Each of the ten perceptual tests will be discussed in turn. For each of them the same type of analysis has been made. The perceptual measures derived from each test have been correlated with all of the many hundreds of variables from the entire assessment battery to determine all relationships significant at the .05 level.<sup>3</sup> As a further step, item-analyses have been made of those adjectives descriptive of personality which were ascribed to the subjects by the assessment staff. Two extreme groups on each measure have been compared on such descriptions to determine all adjectives significantly differentiating the groups at the .05 level. Score distribution statistics are listed in Appendix B.

The purpose of this report is to undertake to show the potential contribution of such perceptual procedures to the assessment and understanding of personality. In particular, this being a study of the determinants of superior functioning in military officers, the stress is upon the perceptual performance of the effective person.

## PERCEPTUAL TESTS AND THEIR RESULTS

### Size-Weight Illusion Test

Individual differences in various kinds of perceptual illusion have often been studied in experimental and personality research. **Thurstone** (9)

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<sup>3</sup>Correlates of the perceptual tests significant at the .05 level are listed in Appendix C.

has investigated factor patterns of some of the classical visual illusions; Witkin (11) and others have worked with the distortion of the vertical in darkness; Kohler and Wallach (5) have studied after-effect illusions; Sherif (7) and others have been concerned with an illusion of movement, namely, autokinetic movement of a light in darkness.

A classical perceptual illusion that has not, to our knowledge, been the subject of personality research is the size-weight illusion. It differs in an important respect from many of the above mentioned illusions in that the perceptual influences transcend a single sense modality. In this illusion, the perceived weight of an object is pronouncedly affected by the perceived size. For example, of two similar objects equal in weight, the smaller will be perceived as the heavier.

Our aim is to measure individual differences in susceptibility to the illusion, individual differences in the fate of the illusion with repeated exposures of the stimulus, and individual differences in persistence of the illusion when the stimulus conditions causing the illusion are removed.

The pertinence to personality assessment is in discovering how such individual differences may relate to various personality dimensions, in order to help in the psychological understanding of these dimensions, and to explore the means of developing predictive instruments for them.

To these ends, a procedure called the Size-Weight Illusion Test was developed and applied to the sample of 100 Air Force officers.

### Apparatus

Two wooden blocks were constructed of the following dimensions in inches: 1.5 x 1.5 x 2.5 and 3 x 3 x 5. The larger, being twice the size of the smaller in each linear dimension, was thus exactly eight times the volume of the smaller. The blocks were hollowed from the bottom end, and lead weights attached and concealed inside in such a manner that the total weight of each block was made equal to 300 grams. A metal ring was attached to the top of each block so that it could be hefted by the subject by placing his forefinger inside the ring.

The two blocks were painted gray. Thus, they looked exactly alike in shape, color, texture, and other respects; but one was eight times the volume of the other. (See Figure 1.)

Pretests with control subjects established that when the two blocks were hefted with eyes closed, they were judged as of equal weight.

Differences found with eyes open can be ascribed, therefore, to the perceived size differences.

For another part of the procedure, two paper covers were constructed for the blocks. They were identical in size and shape. Each had the bottom open so that it could simply be dropped over the block. Slots were cut in the top in order that the cover could drop over the metal ring. For the larger block, the cover was made to fit snugly around it. For the smaller block an identical cover was used, but in addition the smaller block was set upon a small pedestal in order to permit the cover to rest upon the top of the block. With both covers in place, the two blocks then appeared identical in size and shape, and were also identical in weight (300 grams plus the inappreciable weight of the paper cover). (See Figure 2.)

### Procedure

Each subject (S) was tested individually, seated before a table beside the experimenter (E). E first presented the two blocks, saying: "Here are two weights. You are to pick up the larger one, by placing your forefinger in the ring and hefting it once, then putting it down. Then do the same with the smaller one. Your task is to estimate in grams the weight of the second. I will tell you that the weight of the larger is exactly 300 grams. Now go ahead."

After S hefted the weights, E recorded his estimate. Then E asked S to repeat the procedure, and once again recorded the estimate. This continued for 12 successive judgments all done in the same way.

At this point, E placed the two paper covers over the blocks in full view of S, and asked him to go on with the weight judgments as before. No explanation was offered S about the purpose of the covers. Six successive trials were made under this condition.

Then, finally, the paper covers were removed and six more trials were made as in the original condition.

In summary, 24 successive weight estimates were obtained as follows:

Trials 1 - 12 No covers  
Trials 13 - 18 Covers  
Trials 19 - 24 No covers

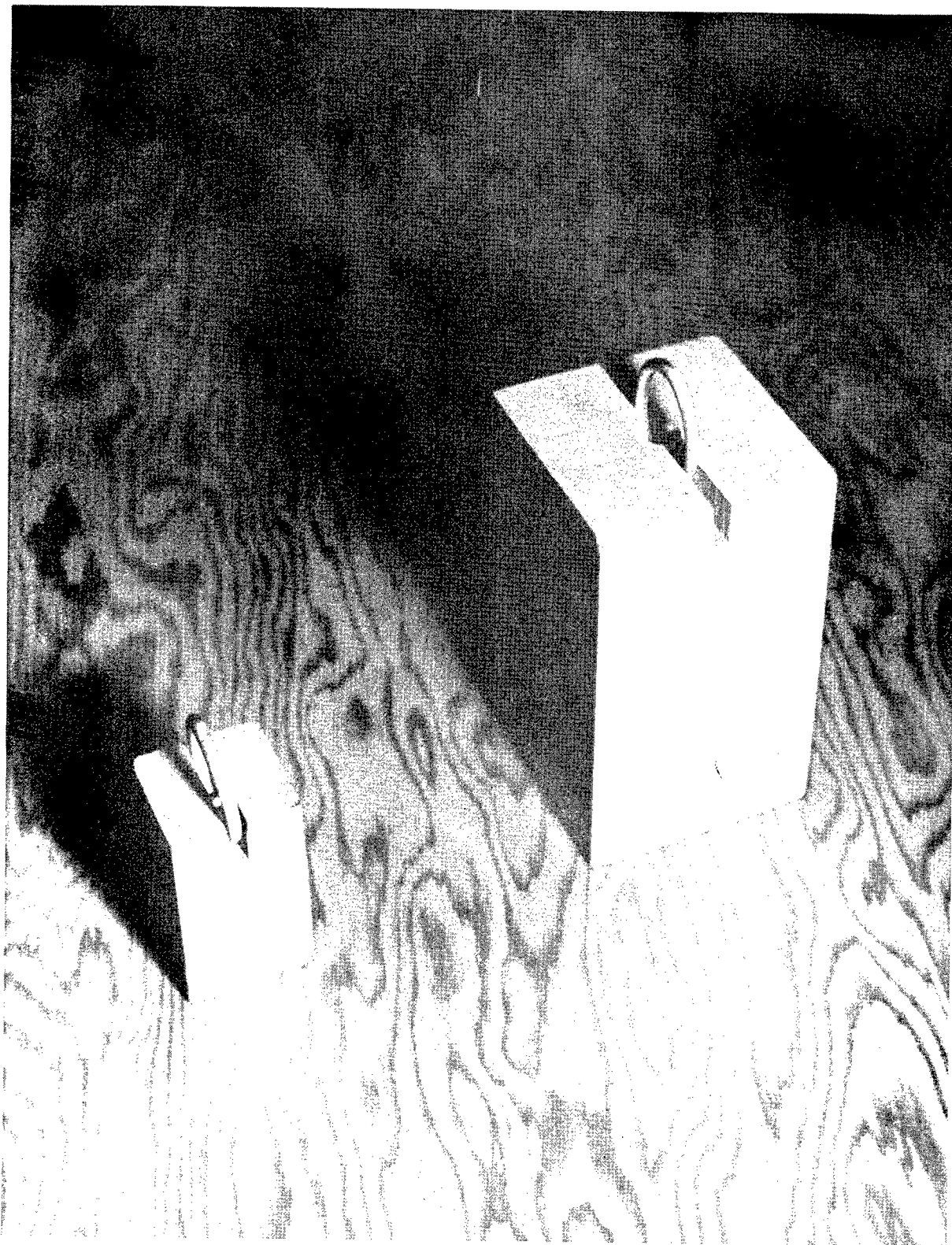


Fig. 1. Blocks used in Size-Weight Illusion Test

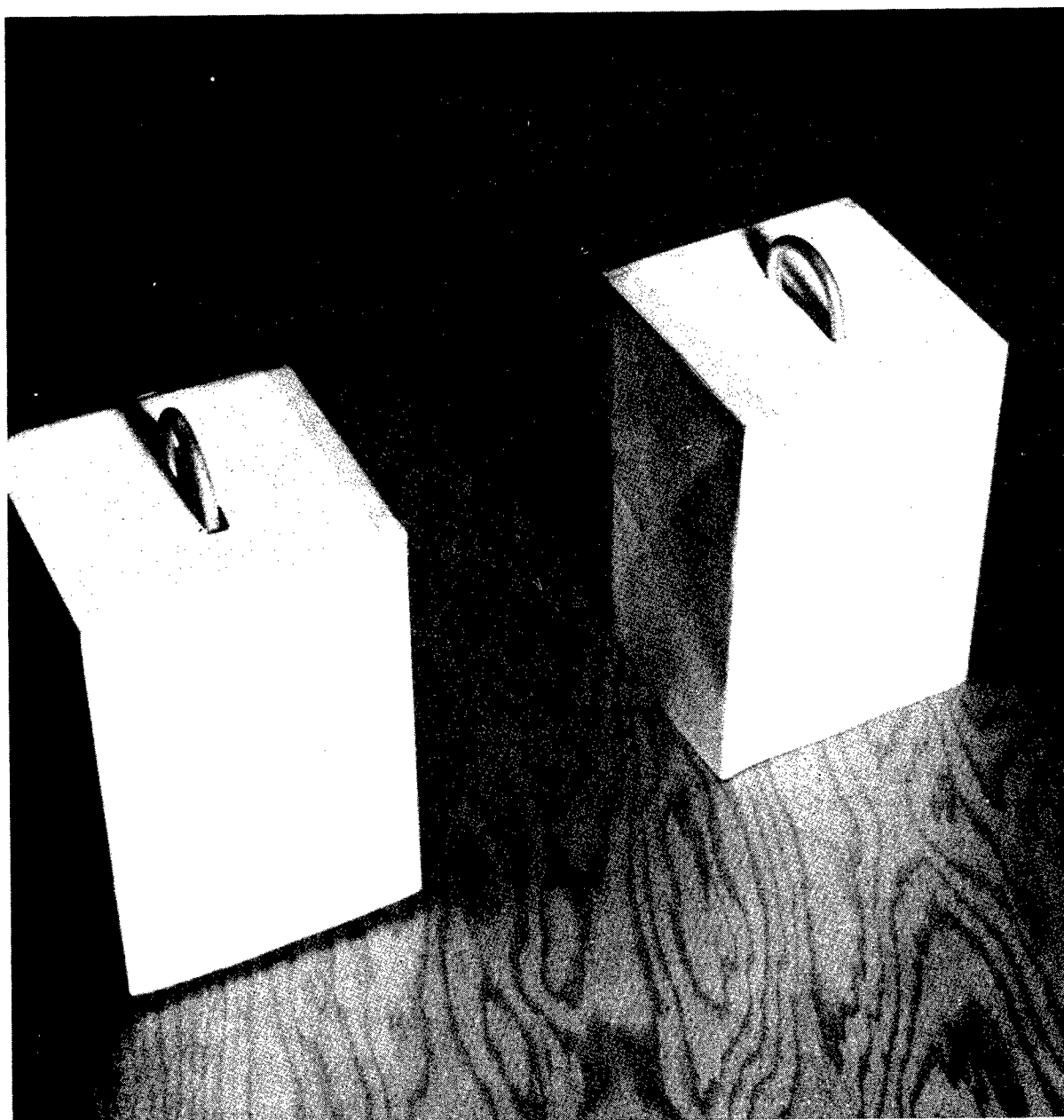


Fig. 2. Covered blocks used in Size-Weight Illusion Test



## Measures

From the 24 estimates obtained from each S, the following seven measures were derived:

1. Magnitude of illusion on trial 1. (Estimate in grams on trial 1. Higher score indicates greater illusion.)
2. Magnitude of illusion on trial 24. (Estimate in grams on trial 24. Higher score indicates greater illusion.)
3. Variability in illusion over 12 trials. (Standard deviation of estimates in grams on 12 trials. Higher score indicates greater variability in estimates.)
4. Mean illusion over 12 trials. (Mean estimate in grams, trials 1 through 12. Higher score indicates greater mean illusion.)
5. Change in illusion, trial 1 to trial 12. (Estimate in grams on trial 1 divided by sum of estimates on trials 1 and 12, expressed as a percentage. Higher score indicates more reduction in illusion over the series of 12 trials.)
6. Number of trials to stabilize judgment. (The ordinal number of last trial in the series on which variation in estimates occurs. Higher score indicates slower stabilization of judgments.)
7. Carry-over of illusion under changed stimulus conditions. (Mean illusion on trials 13 to 18 divided by mean illusion on trials 1 to 12, expressed as a percentage. Higher score indicates more carry-over of illusion when stimulus conditions producing illusion are removed.)

Inasmuch as certain refinements of procedure were introduced following the first week's assessment of ten officers, all statistics for the Size-Weight Illusion Test pertain to only 90 of the 100 officers.

Intercorrelations among the seven measures are presented in Table 1. Four of the seven measures were selected for further analysis because they appeared by inspection of the correlations to have least overlap with one another. The four variables selected were: 4. Mean illusion over 12 trials; 5. Change in illusion, trial 1 to trial 12; 6. Number of trials to stabilize judgment; 7. Carry-over of illusion under changed stimulus conditions. Score distribution data for the four measures are listed in Appendix B.

TABLE 1

## Intercorrelations Among the Size-Weight Illusion Scores

Measures	1	2	3	4	5	6	7
1. Magnitude of illusion on trial 1	---	.55	.53	.77	.32	.24	-.31
2. Magnitude of illusion on trial 24	.55	---	.21	.62	-.08	.00	-.03
3. Variability in illusion over 12 trials	.53	.21	---	.65	-.08	.57	-.33
4. Mean illusion averaged over 12 trials	.77	.62	.65	---	-.23	.26	-.23
5. Change in illusion, trial 1 to trial 12	.32	-.08	-.08	-.23	---	.17	-.21
6. Number of trials to stabilize judgment	.24	.00	.57	.26	.17	---	-.32
7. Carry-over of illusion under changed stimulus conditions	-.31	-.03	-.33	-.23	-.21	-.32	---

Results

For each one of these four separate measures, analysis was done in two ways. First, selection was made out of the total group of 90 officers of the twenty who scored highest on that perceptual measure, the twenty whose scores were in the middle of the distribution, and the twenty who scored lowest. The three groups were compared with respect to adjective descriptions made of them by the assessment staff (without knowledge of the subjects' test performances). Second, a search was made for all other assessment variables correlating significantly at the .05 level with that perceptual measure.

Mean illusion over twelve trials. The correlations between size-weight illusion scores and other variables provide some basis for psychological interpretation of individual tendencies toward susceptibility to the illusion. The first salient fact is that intellectual variables tend to be

negatively correlated with amount of illusion. The highest correlation of any variable with mean illusion is  $-.40$  for an objective index of intellectual performance (Field-Testing Composite: Intellectual competence). Standard intelligence tests, e.g., the Terman Concept Mastery Test, the Wesman Personnel Classification Test, and the Bennett Mechanical Comprehension Test, also are significantly negatively correlated with amount of illusion. Another cluster of variables pertaining to intellectual functioning confirms this same negative relationship with degree of illusion. It includes the Insight Puzzles Test, the Word Rearrangement Test, the California Psychological Inventory (CPI) scales for intellectual efficiency and academic motivation, and the General Information Survey.

Another salient finding is that low susceptibility to the illusion relates significantly to good judgment in the person. The pertinent variables are Field-Testing Composites of Good Judgment and Fairmindedness, the CPI scale for tolerance, a test of accuracy of judgment of personality, and the staff rating on evaluation of ideas.

The generally favorable character of the correlates of low susceptibility to the illusion is further revealed in the following Q-sort items: "Is turned to for advice and reassurance," "Derives personal reward and pleasure from his work," "Gets along well in the world as it is," "Is a conscientious, responsible, dependable person."

Conversely, those variables positively correlated with amount of illusion tend to reflect unfavorable features of the person. The second highest correlation ( $.35$ ) found in the entire matrix is with a measure of "manifest anxiety" in several problem-solving situations. Among other variables showing significant positive correlations with illusion are two Q-sort items: "Is at odds with himself," and "Is rebellious toward authority figures."

Certain other perceptual performances in assessment also involve susceptibility to illusion, though in modalities entirely removed from the size-weight illusion. One of these is distortion in the apparent vertical produced by a tilted visual framework. Another is the persistence of a kinesthetic adaptation effect. The two correlate  $.23$  and  $.24$ , respectively, with Size-Weight Illusion scores; thus we find some evidence for a generalized susceptibility to perceptual illusion in some individuals.

The men having the highest scores--indicating greatest susceptibility to the size-weight illusion--are more frequently described by observers using the Adjective Check List as awkward, tense, restless, opinionated, headstrong, stubborn, and talkative. The low scorers are seen in a distinctly more favorable light, being described as civilized, efficient,

energetic, dependable, intelligent, good-natured, poised, and self-confident. It is also of interest to note that both the middle and the low groups are seen as more stable, self-controlled, organized, reasonable, and fair-minded than the high group.

Change in illusion, trial 1 to trial 12. Examination of the assessment variables which correlate most highly with change in illusion suggests the importance of a dimension of flexibility-inflexibility in the person's cognitive and motivational processes. Reduction in illusion is correlated with the CPI scale for intellectual efficiency, a rating of originality of productions on the Thematic Apperception Test, a staff rating of evaluation of ideas, a more rapid self-recognition and more rapid recognizability (by others), number of life activities, etc.

The tendency for the illusion to persist during repeated exposure to the stimuli is correlated with three measures of the Personal Preference Scale (prenatal, early oral, and late oral), with the Self-Maintenance and Infrequency scales of the CPI, with the Strong Vocational Interest Blank (SVIB) key for President of Manufacturing Concern, with two Q-sort items: "Is pedantic and fussy about minor things," and "Is unaware of his social stimulus value," etc.

A comparison of the high-scoring, middle, and low-scoring groups on this measure also reveals differences, especially between the highs and the lows, in the manner in which they were described by the staff observers. The high scorers, i. e., those who show the greatest reduction in illusion over the twelve trials, are characterized by such adjectives as serious, clear-thinking, cool, reflective, evasive, and reserved. The individuals who exhibit persistence in the illusion (or even increase in it) are described as stubborn, loyal, persevering, natural, and steady.

In summary, the tendency for the size-weight illusion to disappear with repeated trials seems to be somewhat related to certain characteristics pertaining to cognitive and motivational flexibility. Those subjects who, so to speak, "hang on" to their illusion appear to be characterized by more stubbornness and inflexibility. However, the significant correlations are few in number and modest in size, and no more than a suggestive relationship is found.

Number of trials to stabilize judgment. The Adjective Check List analysis reveals that the men who stabilize their weight judgments only after many trials are more frequently seen as serious, distrustful, cool, and quick. The men making average scores appear to observers as modest, natural, peaceable, good-natured, unassuming, and conventional. The low scorers--those who stabilize their judgments almost at once--are seen

by staff raters as dominant, hard-headed, opportunistic, self-seeking, bossy, enterprising, and shrewd.

Analysis of assessment variables adds to this picture. For example, number of trials before a stabilized weight judgment occurs is positively correlated with the CPI Flexibility scale. Moreover, there are several assessment variables indicative of being a "strong-minded" person with firmly established views of self and others which are found to go with the tendency to establish a firm, unmodified judgment early in the series. These include the CPI Dominance scale, the SVIB Interest Maturity scale, and the test-retest correlation and the correlation of descriptions of self and ideal self on the Adjective Check List.

Carry-over of illusion under changed stimulus conditions. High scores on this measure indicate that the individuals were least responsive to changed stimulus conditions and were suggestibly persistent in the illusion after removal of the stimulus difference causing it. Such individuals are described on the Adjective Check List as confused, considerate, gentle, honest, nervous, defensive, and meek. The middle scorers appear to observers as unassuming, relaxed, reliable, natural, and peaceable. The low scorers are described in such terms as interests wide, aggressive, dissatisfied, and enterprising.

The list of significant assessment correlates of the measure is short, yet from it a fairly consistent pattern can be discerned. In general, the positive correlates are of an unfavorable character and the negative correlates of a favorable character.

Thus, inflexible perseveration of the illusion tends to be associated with indications of rigidity, disturbance, and ineffectiveness in attempts to cope. Noteworthy are the ratings of rigidity and pathogenicity of childhood, the CPI scale for delinquency, "unrelieved dominance" behavior in Improvisations, the tendency to make a larger number of guesses in Charades but with less effectiveness, and the greater frequency of Rorschach W, which may in this case reflect the kind of so-called "whole compulsion" that would be entirely consistent with the inflexible perseveration of the illusion. That high scorers on this measure also get somewhat higher scores on the SVIB key for Officer Candidate Leadership and are rated higher on positive valuation of the military identity raises interesting questions in this connection.

The negative correlates support the above picture. Low scores on the measure tend to go with several indicators of adaptive flexibility, e.g., shift of adaptation level in the Weight Judgment Test, effectiveness of guessing in Charades, ratings of evaluation of ideas and of fairmindedness.

They are also associated with several kinds of indicators of emotional freedom and spontaneity in the person, e.g., enjoyment of aesthetic and sensuous impressions, emphasis on oral pleasure, and tendency on the Rorschach to give movement and human responses, and a greater volume of responses.

### Conclusions

The Size-Weight Illusion Test, here developed and evaluated for the first time, offers some promise as an assessment device. Though requiring individual administration, the method is simple and relatively economical.

Four measures derived from several ways of scoring the test performance appear to differentiate the officers in a number of psychologically relevant characteristics, although it should be emphasized that the relationships are few in number and generally of no more than borderline significance: (a) Susceptibility to illusions: Those men exhibiting least susceptibility to the illusion are rated and scored as superior in intellectual traits, in good judgment, and in general soundness of social and personal adjustment. (b) Change in illusion: By and large, the tendency for the illusion to diminish during the twelve successive stimulus exposures is associated with favorable personality characteristics, e.g., intellectual efficiency, lack of stubbornness. (c) Readiness to stabilize judgments: Those men exhibiting tendencies toward a very early stabilization of judgments in the series of twelve trials appear to be characterized by dominance, strong ego-organization, and an independent and somewhat authoritarian outlook, coupled with an insensitivity toward others. (d) Carry-over of illusion: Those men exhibiting greatest perseveration of the illusion even after the stimulus conditions evoking it have been eliminated seem to be disturbed and rigid. Conversely, those men most responsive to the changed conditions tend to be characterized by greater adaptive flexibility and emotional spontaneity.

### Weight Judgment Test

The Weight Judgment Test as developed here is based upon the work of Klein (3). It measures characteristics of the individual's shifts in "adaptation level" of weight judgments as a function of systematic stimulus changes introduced without his knowledge. There is evidence that such simple perceptual tendencies reflect more general characteristics of the person's sensitivity and adjustment to changes in his surroundings, such as the speed, flexibility, and method of establishing judgmental norms. In general, therefore, this test is intended to throw light on important aspects of the individual's cognitive adjustment to a changing environment.

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## Procedure

Each S is tested individually. He is seated in a chair equipped with a desk-arm and a shield which prevents him from seeing the stimulus weights which E places beside his hand. His arm rests naturally on the desk-arm in such a manner that he may easily heft the weight by grasping it with thumb and fingers and flexing the wrist.

There are eight weights in the series. They are constructed of 2.5-inch cookie cutters with knobs on top. Pieces of lead are attached inside the cutters in such a manner as to produce the following series of gram weights: 40, 49, 61, 75, 92, 113, 139, 171. This series is so designed that each weight is approximately 1.23 times the weight of the preceding one.

At no time does S see the weights, nor is he told the number of weights in the total series. To begin with he is given the following instructions:

"We are going to ask you to give judgments of a number of weights. I'll place one weight at a time by your hand and you will heft it once, lifting it just a short distance. Grasp the weight by the handle only.

"You will be asked to give one of three judgments of the weight--light, medium, or heavy. I'll give you a sample of the kinds of weights you'll be hefting."

(E successively presents weights 3, 1, and 5.)

"Since you will have to judge a large number of times, above a hundred in all, I'll ask you to judge fairly quickly."

The stimulus series appears in Table 2. It will be noted that in the beginning only weights 1-5 are used. After 50 judgments, each of the five weights having been presented 10 times, weight 6 is introduced and weight 1 dropped from the series. After 20 more judgments, weight 7 is introduced and weight 2 dropped. After 20 more judgments, weight 8 is introduced and weight 3 dropped. Finally, after 20 more judgments, weight 4 is exposed 10 times in succession.

As each judgment is made, E records the response as "light," "medium," or "heavy."

TABLE 2

## Stimulus Series of Weights\*

Block Number

1.	5	3	1	2	4	2	5	1	3	4
2.	5	3	1	2	4	2	5	1	3	4
3.	3	2	1	5	4	1	4	5	2	3
4.	5	3	1	2	4	2	5	1	3	4
5.	3	2	1	5	4	1	4	5	2	3
6.	6	4	2	3	5	3	6	2	4	5
7.	4	3	2	6	5	2	5	6	3	4
8.	7	5	3	4	6	4	7	3	5	6
9.	5	4	3	7	6	3	6	7	4	5
10.	8	6	4	5	7	5	8	4	6	7
11.	6	5	4	8	7	4	7	8	5	6
12.	4	4	4	4	4	4	4	4	4	4

\*1 (40 grams), 2 (49 grams), 3 (61 grams), 4 (75 grams), 5 (92 grams), 6 (113 grams), 7 (139 grams), 8 (171 grams).

Measures

For scoring purposes, a value of minus one was assigned to a "light" judgment, a value of zero to a "medium" judgment, and a value of plus one to a "heavy" judgment. The judgments were combined in blocks of 10, thus giving five such blocks before weight 6 was introduced, two more blocks before weight 7 was introduced, two more before weight 8 was introduced, and two more after that. A total score was obtained for each block by summing the score values for the judgments in that block. Not all judgments were used in such summing, but rather a selected set designed to permit a direct evaluation of the effect of introducing the heavier weights in the series. What was done was to sum only for weights 2-5 only on blocks 1 through 7; for weights 3-6 on blocks 6 through 9; for weights 4-7 on blocks 8 through 11. An average score for blocks 4 and 5 was computed and used as the basis for all further computations involving block 5 (the assumption being that this would provide a somewhat more stable estimate of the judgment tendencies just preceding the introduction of weight 6).



Four measures were derived using the above scoring scheme. They are as follows:

1. Total shift in adaptation level. (Sum of the following differences: block 5 minus block 7; block 7 minus block 9; block 9 minus block 11. Higher values indicate greater total shift in adaptation level as a consequence of the introduction of new stimuli.)
2. Immediate shift in adaptation level. (Sum of the following differences: block 5 minus block 6; block 7 minus block 8; block 9 minus block 10. Higher values indicate greater immediate shift in adaptation level as a consequence of the introduction of new stimuli.)
3. Maximal shift in adaptation level. (Value is the largest of the three differences computed in Measure 2. Higher value indicates greater maximal immediate shift in adaptation level as a consequence of the introduction of new stimuli.)
4. Variability in adaptation level. (Sum of the differences without regard for sign between the following pairs of blocks: 2-3, 3-4, 4-5, 6-7, 8-9, 10-11. Higher value indicates greater fluctuation in adaptation level without changes in the actual stimuli.)

Norms for the above measures for the 100 officers are listed in Appendix B.

## Results

Measures 1, 2, and 3 constitute different ways of measuring the amount of effect produced in the individual's adaptation level of weight judgments as a function of the unannounced introduction of heavier weights in the series, while Measure 4 deals with variability in judgments without changes in the stimuli. Preliminary inspection revealed that Measure 2--the amount of adaptation level shift immediately following the introduction of the heavier weights--has the highest average intercorrelation among the four measures. For this reason, our discussion here will be limited to Measure 2.

Scores on the measure have been correlated with all the other assessment measures. Significant correlations are presented in Appendix C. Inferring from the significant positive correlates, the tendency to be responsive to changes in the stimulus series of weights by shifting one's adaptation level is related to a number of favorable characteristics

centering on effective interpersonal relationships. This is indicated by the following illustrative variables: social adjustment rated by graphology, effectiveness of performance in a group task (Bingo), leadership measured by the Minnesota Multiphasic Personality Inventory (MMPI) Lp scale, effectiveness of guessing in a group game (Charades), ease in interpersonal relationships rated by interviewer, and role-playing ability measured by the MMPI Rp scale.

This is further supported by positive relations with a number of variables pertaining to criteria of officer effectiveness: ratings of work effectiveness, responsibility, and human relations skills from the Job-Concept Interview; the Military Officer Effectiveness scale of the IPAR inventory; the Communality scale of the Air Force Preference Inventory.

The tendency toward rapid shifting of adaptation level also bears the hypothesized relationship with certain other measures of tempo, fluidity, and spontaneity in the person's behavior, as illustrated by positive correlates with high tapping rate, with percent of movement responses in the Rorschach, and with a shift of angular orientation in a periscopic tracing task in darkness. Moreover, such trends are reflected in cognitive tasks requiring adaptive and insightful flexibility. Thus, those with rapid shifts in weight-adaptation level are superior in the Bingo and Charades group problem procedures mentioned above, in the Insight Puzzles Test, and in the Match Problems of the Guilford Creativity Test.

Conversely, from the significant negative correlations it may be inferred that the tendency not to adjust adaptation level in response to changes in the stimulus series tends to be associated with a rather unfavorable set of characteristics, centering on (a) inadequate relations with others, (b) rigidity and excessive ego-control, and (c) inner anxiety. Such relevant variables as the following are notable: (a) the MMPI Dissimulation Index, the MMPI scale of social introversion, early oral and prenatal scales of the Personal Preference Scale, and slowness to cooperate in a group task (Bingo); (b) MMPI Ego-Control, rigidity as rated by the assessment staff; (c) pulse and blood pressure elevation, MMPI-Psychasthenia, and a Q-sort characterization--"Is influenced by diffuse personal feelings and intangible subjective facts."

The 20 officers with highest scores on this measure, the 20 with the lowest scores, and the 20 with middle scores, have been compared with respect to adjectives used to describe them by the assessment staff. Relatively few discriminating adjectives are found. There appears to be some tendency for the high scorers, i. e., those men whose adaptation level shifts most markedly in response to the heavier weights, and the low scorers, i. e., those men whose adaptation level shifts little or not at all, to be seen by the

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assessment staff in less favorable terms than the middle scorers. Thus the high scorers are described as careless, disorderly, suggestible, trusting, and soft-hearted, while the low scorers are seen as shallow, mannerly, and demanding. The middle scorers, on the other hand, are more likely to be characterized in terms indicative of a well-organized achiever, e. g., methodical, efficient, unaffected, (not) easy-going, (not) peculiar, etc. However, it should be stressed that the evidence from the adjective descriptions is meager at best.

### Conclusions

It appears that the readiness with which an individual adjusts his adaptation level of weight judgments when heavier weights are introduced without warning into the series is not indifferently related to broader aspects of his assessment performance and personality. Although the relationship is low, the analogy is striking: readiness to shift one's adaptation level as the external stimuli change is positively related to effective and responsive relationships with other people, to adaptive and insightful flexibility in problem-solving, especially in group problems involving others, and to spontaneity of behavior. Conversely, lag in shifting one's adaptation level as the external stimuli change is associated with social introversion and disturbed relations with others, with excessive ego-control, and with manifestations of inner anxiety.

On the basis of minor evidence from adjective descriptions, it may further be speculated that those men who score in the middle of the range, being neither overly quick nor overly slow to shift adaptation level, may optimally combine those characteristics making generally for a well-adjusted, organized, efficient, middle-of-the-road performance.

### Progressive Squares Test

This test is adapted from the work of Klein (3) and others on individual differences in shifts in adaptation level. Although it parallels the Weight Judgment Test in its scheme of introducing unannounced gradual changes in the stimulus series, it differs in employing another sense modality and in requiring absolute rather than relative judgments.

As in the case of the Weight Judgment Test, scores on this test may be presumed to throw light on the individual's sensitivity to objective changes in his environment and on his characteristic ways of adapting his standards of judgment to these changes.

## Procedure

Ss were tested in groups of five, seated in a semidarkened room facing a blank wall on which slides were projected. The slides consisted of drawings of outline squares, varying in linear size from 2 to 20.5 inches. The Ss were provided with record sheets with spaces numbered for 145 judgments. They were told that squares would be projected for intervals of a few seconds each and were instructed to write down an estimate of the linear size of each square to the nearest one-half inch.

The squares were exposed briefly, for approximately three seconds each. An interval of about three seconds occurred between slides in order to give S time to record his judgment. The slides were projected at different locations on the wall in a random order, so that S would not be able to use local reference points as cues in estimating the size. The slides were photographic negatives of black on white drawings, hence when projected, all that was visible was the outline square without framing, which made the size-judgment task a relatively difficult one.

The stimulus series began with the smallest square of two inches. After it was exposed and S's judgment recorded, E announced to the group that the correct size of the square was two inches. (This was done to provide all Ss with the same initial standard of judgment.) After this first slide, E made no further announcements as to correct size.

The stimulus series is shown in Table 3. It will be observed that during the first 17 trials, the five smallest squares only were presented in a systematically varied order. On trial 18 the next larger square (5.5 inches) was introduced and the smallest square (2 inches) dropped out. This procedure of gradually introducing larger squares and eliminating smallest ones was continued throughout the series until near the end. Thus, the series from trials 117 through 135 consisted of the five largest squares, varying from 9.5 to 20.5 inches in size.

On trial 136, a middle-sized square of 6.5 inches was introduced and repeated for 10 successive trials, which ended the series. The purpose was to study the flexibility of readjustment to adaptation-level when a substantially smaller square was thus suddenly exposed.

## Measures

Various measures were derived from the test performances. Some of them pertained to "adaptation level," meaning merely the absolute magnitude of the size judgments given at different stages in the stimulus

TABLE 3

## Stimulus Series for the Progressive Squares Test

<u>Trial</u> <u>No.</u>	<u>Size of</u> <u>Square</u> <u>in</u> <u>inches</u>	<u>Trial</u> <u>No.</u>	<u>Size of</u> <u>Square</u> <u>in</u> <u>inches</u>	<u>Trial</u> <u>No.</u>	<u>Size of</u> <u>Square</u> <u>in</u> <u>inches</u>	<u>Trial</u> <u>No.</u>	<u>Size of</u> <u>Square</u> <u>in</u> <u>inches</u>	<u>Trial</u> <u>No.</u>	<u>Size of</u> <u>Square</u> <u>in</u> <u>inches</u>
1.	2	30.	4.5	59.	5.5	88.	11.5	117.	9.5
2.	2.5	31.	3	60.	6.5	89.	8	118.	17
3.	4.5	32.	3.5	61.	4.5	90.	9.5	119.	14
4.	3	33.	6.5	62.	5.5	91.	6.5	120.	11.5
5.	3.5	34.	4.5	63.	9.5	92.	8	121.	9.5
6.	2.5	35.	5.5	64.	6.5	93.	14	122.	11.5
7.	3	36.	3.5	65.	8	94.	9.5	123.	20.5
8.	2	37.	4.5	66.	5.5	95.	11.5	124.	14
9.	4.5	38.	3	67.	6.5	96.	8	125.	17
10.	3.5	39.	6.5	68.	4.5	97.	9.5	126.	11.5
11.	2	40.	5.5	69.	9.5	98.	6.5	127.	14
12.	2.5	41.	3	70.	8	99.	14	128.	9.5
13.	4.5	42.	3.5	71.	4.5	100.	11.5	129.	20.5
14.	3	43.	6.5	72.	5.5	101.	6.5	130.	17
15.	3.5	44.	4.5	73.	9.5	102.	8	131.	9.5
16.	2.5	45.	5.5	74.	6.5	103.	14	132.	11.5
17.	3	46.	3.5	75.	8	104.	11.5	133.	20.5
18.	5.5	47.	4.5	76.	5.5	105.	9.5	134.	17
19.	3.5	48.	8	77.	6.5	106.	8	135.	14
20.	4.5	49.	5.5	78.	11.5	107.	9.5	136.	6.5
21.	3	50.	6.5	79.	8	108.	17	137.	6.5
22.	3.5	51.	4.5	80.	9.5	109.	11.5	138.	6.5
23.	2.5	52.	5.5	81.	6.5	110.	14	139.	6.5
24.	5.5	53.	3.5	82.	8	111.	9.5	140.	6.5
25.	4.5	54.	8	83.	5.5	112.	11.5	141.	6.5
26.	2.5	55.	6.5	84.	11.5	113.	8	142.	6.5
27.	3	56.	3.5	85.	9.5	114.	17	143.	6.5
28.	5.5	57.	4.5	86.	5.5	115.	14	144.	6.5
29.	3.5	58.	8	87.	6.5	116.	8	145.	6.5

series. Other measures pertained to the accuracy of the size judgments at different stages in the series. Still others pertained to the manner in which S readjusted his standard of judgment when the middle-sized square was suddenly reintroduced at the end of the series. Finally, one measure pertained to the amount of inconsistency in judgments of certain identical squares as they recurred during the series.

Preliminary inspection of the entire correlation matrix showed that most of these measures correlate little or not at all with other assessment variables. This is especially the case with the main measures for which the procedure was designed, namely, those having to do with the amount and accuracy of shift of adaptation level. These measures will not, therefore, be further discussed in this report.

However, two of the other measures, which were initially considered of only rather incidental interest, prove to yield a number of striking and meaningful correlations with other assessment variables. These two measures are:

1. Inflexibility in readjustment of adaptation level. (Sum of size judgments on trials 136-140 divided by sum of size judgments on trials 123-135, expressed as a percentage. A higher score indicates greater inflexibility of readjustment of adaptation level following reintroduction of the middle-sized square at end of series.)
2. Inconsistency of judgments. (Composite of two indices of relative variability of repeated size judgments of the 4.5 inch and 11.5 inch squares throughout the series. A higher value indicates greater inconsistency in repeated judgments of the same stimulus, with adaptation level held constant.)

Score distribution statistics for the above two measures for the 100 officers are listed in Appendix B.

## Results

Inflexibility in readjustment of adaptation level. The men exhibiting most inflexibility are described by such adjectives as inhibited, slow, timid, good-natured, calm, and narrow in interests. This general picture of psychological narrowness is extended by the assessment correlates of the inflexibility scores, including the following: stereotyped and unoriginal (Q-sort item), ethnocentric and conservative attitudes measured by the University of California Public Opinion Scales E (ethnocentrism) and

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PEC (political and economic conservatism), SVIB scales for President of Manufacturing Concern, Purchasing Agent.

The officers with low scores on the measure (that is, those less inflexible) are described in a strikingly different way by the assessment staff. The lengthy list of generally favorable adjectives ascribed to them falls roughly into five clusters: clear-thinking, capable, and organized; insightful, clever, and original; active, restless, and quick; loud, talkative, and warm; headstrong, egotistical, and opportunistic.

Of the 67 assessment variables which correlate with the measure at or beyond the .05 level of significance, all but seven have negative coefficients. The majority of them lend themselves to grouping in the following five categories, which are similar to but not identical with the clusters of descriptive adjectives listed above.

- a. Intellectual ability and interests. Concept Mastery Test, staff ratings of intellectual ability and of evaluation of ideas, General Information Survey, rating of knowledgeability in Charades, Q-sort items: "Highly cathects intellectual activity; values cognitive pursuits."
- b. Originality. Staff rating of originality, Guilford Creativity Tests, fluency of ideas and put-outs in Charades, Word Rearrangement Test, IPAR Questionnaire Capacity for Independence scale.
- c. Activity. Motility in Charades, elevated blood pressure and heart rate, variability in adaptation level in Weight Judgment Test, speed of satiation in Kinesthetic After-Effect Test.
- d. Maturity. CPI Responsibility scale, SVIB scale of Interest Maturity, staff rating of self-insight, emotional stability rated from graphological analysis.
- e. Identification with and interest in others. Personal Preference Scale -- desire to help and identification with children, parents, old people; SVIB scales for YMCA Secretary, Minister, City School Superintendent, etc.

Considering together the trends from the adjective descriptions and the correlational analysis, it would appear that this particular kind of inflexibility of perceptual performance reflects a more general inflexibility in the person (though, to be sure, the relationships are of only modest size). By and large, the picture of those who show relatively little

readiness to adjust adaptation level in response to sudden changes in stimuli is one of psychological constriction and narrowness and of a lack of the kind of intelligence, adaptability, drive, and spontaneity which tends to characterize those at the other extreme of the measure.

Inconsistency of judgments. This measure pertains to the extent to which the individual tends to give variable judgments of size of a given square when it is repeatedly exposed. It is independent of degree of change in adaptation level, being computed as the relative variability of judgments within a sequence of trials in which the span of objective stimuli remains constant.<sup>4</sup>

Looking first at those men who are most consistent, i. e., show low indexes of inconsistency in judgment, it becomes clear that they are generally perceived and rated by the assessment staff in favorable terms. The significant adjectives characterizing these men are: cooperative, conscientious, dependable, easy-going, reasonable, sympathetic, unaffected, unassuming. The key-note appears to be stability and soundness.

This favorable picture is reinforced by many of the significant negative correlations of inconsistency with other assessment variables:

Interviewer's ratings of moral character, need for achievement, career or work satisfactions, ability to obtain sexual gratification.

Q-sort items: "Identifies with the values, actions, attitudes, etc., of his professional group." "Is masculine in his style and manner of behavior." "Is gregarious; prefers interpersonal and group situations to intra-personal circumstances."

IPAR Questionnaire - Personal soundness scale

Bingo Test - rating of over-all effectiveness of performance in group task.

Conversely, the tendency to be inconsistent in judgments in this test is associated with generally unfavorable attributes. For instance, the descriptive adjectives ascribed to men scoring very high on inconsistency are as follows: autocratic, blustery, bossy, determined, dissatisfied, distrustful, egotistical, immature, opinionated, opportunistic, prejudiced, rebellious, suspicious. Many of the assessment variables which correlate

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<sup>4</sup>The correlation of this measure with total amount of shift in adaptation level during the experimental series is .04. This measure is also relatively independent of Measure 1 (Inflexibility in readjustment of adaptation level), the correlation being -.15.



positively with inconsistency are likewise of a clearly unfavorable character:

Personal Preference Scale--late oral, phallic, feminine identification  
Anxiety rating (in performance on Arthur Stencil Test and Insight Puzzles Test)  
Improvisations--rating of submissiveness  
Perception of Vertical--error in judgment  
Q-sort items: "Over-controls his impulses; is inhibited; needlessly delays or denies gratification." "Fears possible future privation; anticipates being exploited and cheated."  
MMPI--Sc (Schizophrenia) scale

### Conclusions

The Progressive Squares Test was designed and administered in the expectation that there would be pronounced individual differences in the manner in which adaptation level of judgments varies with gradual shifts in the range of objective stimuli, and that such individual differences would be found to relate significantly to other measured dimensions of personality. The first expectation was confirmed. The second was only partially confirmed, inasmuch as those principal measures most closely pertaining to degree and manner of shift in adaptation level prove to have relatively few significant assessment correlates.

On the other hand, two additional measures do prove to be of considerable interest. In the first--relative inflexibility of adaptation level in response to changing stimuli--there is fairly convincing evidence that inflexibility in this kind of perceptual performance reflects more general traits of inflexibility in the person. The second--degree of variability of judgments--also exhibits a sensible relationship to broader aspects of the individual's personality, inasmuch as stability and consistency of these perceptual judgments are found to be associated significantly with other indicators of psychological stability in the person.

As an assessment device, the present technique appears to hold promise, but to require substantial further development and modification if it is to increase its effectiveness in discriminating relevant features of personality.

## Perception of Vertical Test

This test is adapted directly from the research of Witkin et al (10) on factors influencing accuracy of perception of the vertical in darkness in the presence of a tilted visual framework. In accordance with the findings of Witkin and others it may be presumed that the performance in this test should relate significantly to several important dimensions of personality, especially dependency, suggestibility, and tendencies toward disorientation.

### Procedure

The apparatus and test procedure were modifications of those described by Witkin. A painted lucite square, 36 x 36 inches, was mounted in the upright plane on an axle in such a manner that it could be tilted either to the right or to the left of vertical. Its edges were so grooved and internally lighted that a square outline of light could be made visible in the darkroom. A lighted lucite rod was mounted coaxially directly in front of the square, and was freely rotatable. A three-way selsyn system permitted the subject to rotate the rod to any desired angle by adjusting a knob from his position approximately three feet in front of the rod and frame. A similar control permitted the experimenter to change the angle of the rod, and also to read off on a dial the angular tilt of the rod as set by the subject. (See Figure 3.)

S was brought into the room blindfolded and placed standing in front of the apparatus. With blindfold removed and with no other visual cue than the rod and frame, he was then given a series of eight trials, on half of which he was instructed to make the rod "truly vertical, that is, vertical with respect to the earth," and on half, "truly horizontal, that is, horizontal with respect to the earth." The trials were made with the frame alternately tilted 28 degrees to the right and 21 degrees to the left of vertical.

S was then seated in a chair tilted 28 degrees to the right, with head fixed in a headrest. Eight more trials followed in the same pattern as those in the previous standing condition.

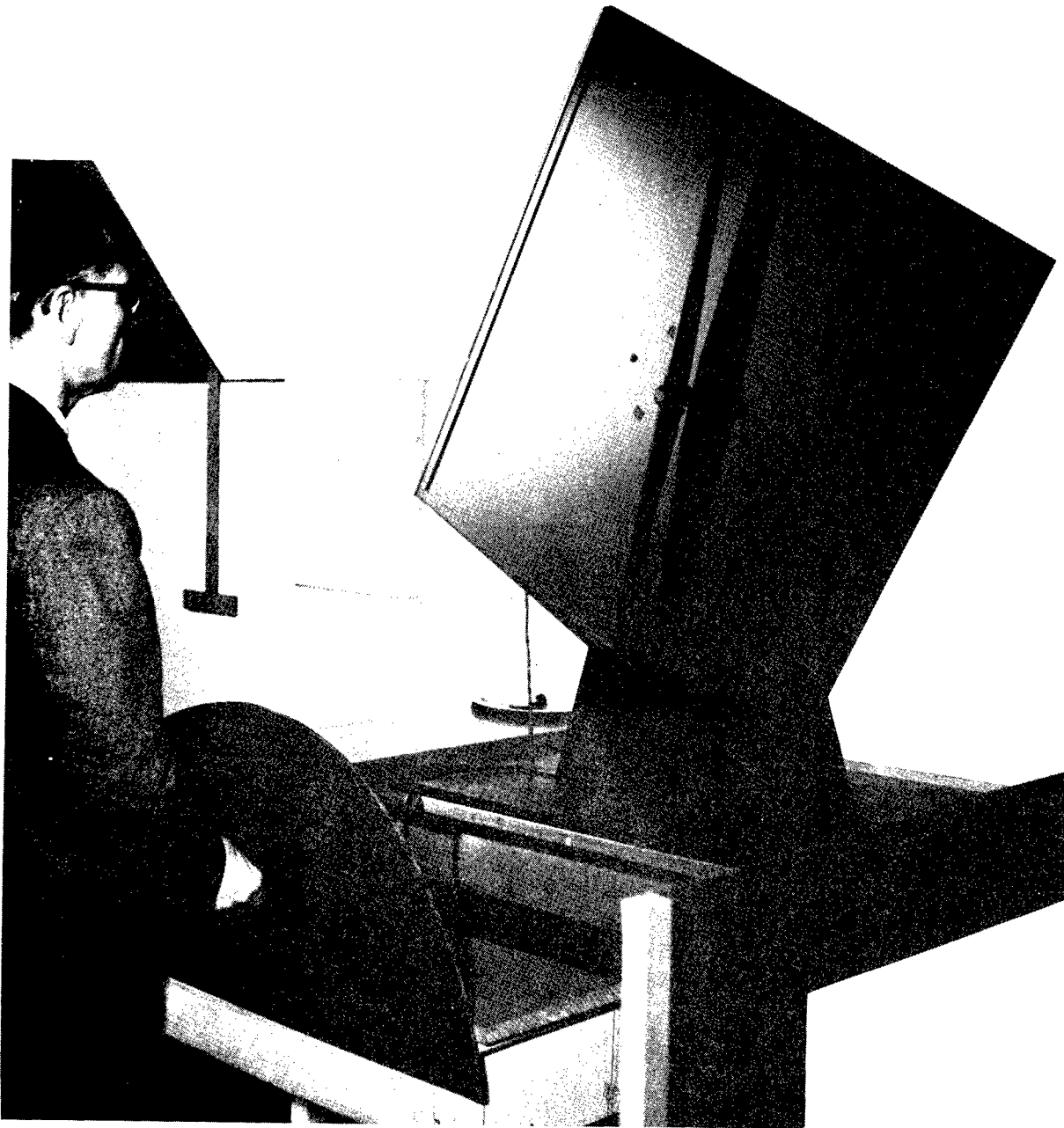


Fig. 3. Apparatus for Perception of Vertical Test

## Measures

Various measures were computed from the data for each of the 90 officers.<sup>5</sup> Some pertained to the average amount of angular error of the judgments, others to the degree of angular displacement toward the tilted frame. Some pertained to the standing condition, others to the sitting condition. For the sake of convenience in scoring performance on these measures, the errors on the "horizontal" judgments and those on the "vertical" judgments were treated alike and combined. Justification for this step is based on the finding that there is a high relationship between scores in the two conditions. Throughout what follows, therefore, the combined scores for the "horizontal" and "vertical" conditions are referred to as pertaining to judgments of the "vertical."

The single measure that will be reported on here is the straightforward one found most discriminating by Witkin, namely, the net displacement toward the tilted frame in angular degrees with S standing. This is a measure of the extent to which the person's judgments of the vertical are influenced by the tilted visual framework.

The great majority of net displacements were in the direction of the tilted frame. Of the 90 officers, only 13 had net displacements opposite to the tilt of the frame, and the largest of such negative displacements was only two degrees. The displacements range from minus two to plus 14 degrees, with a mean of 3.6 degrees. There is a marked positive skew.

## Results

The significant assessment correlates of the displacement score are listed in Appendix C. A consistent and striking pattern of relationships emerges. Displacements toward the tilted framework are associated with tendencies of ego-weakness and dependency in the personality, and with an orientation toward and concern with other people. Conversely, the absence of influence by the tilted frame tends to be associated with intelligence, originality and analytical abilities, independence of personality, and orientation toward cognitive rather than social objects. Each of these aspects is discussed under the following headings.

Intelligence. Those officers exhibiting little or no distorting influence by the tilted frame tend to score higher on various measures of intelligence.

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<sup>5</sup>This procedure was not administered in the first week of assessment, hence scores are available on only 90 of the 100 officers.

The highest correlation,  $-.31$ , is with the Concept Mastery Test, a high-level test of mental functioning. Other significantly correlated intelligence measures include the Wesman Personnel Classification Test, and the Bennett Mechanical Comprehension Test.

Spatial reorganization ability. Resistance to the influence of the tilted framework is also related to that aspect of intellectual functioning that has to do with spatial relations and spatial reorganization. Examples are the significant correlations with the Insight Puzzles Test, the Gottschaldt Figures Test, and the Arthur Stencil Test. A spatial relations factor score derived from a factoring of these and other assessment measures correlates  $-.35$  with displacement score.

Analytical ability and interest. The more analytical the orientation of the person the smaller the displacement effect. This is clearly seen in a pattern of correlations with other perceptual performances which reveal emphasis upon accuracy and sensitivity to detail, for example, percent of detail responses on the Rorschach, accuracy of tracing in the Periscopic Tracing Test, sensitivity to stimulus change in the Weight Judgment Test, and correct use of words in the Word Rearrangement Test. It is also revealed in a pattern of vocational interests congruent with an analytical orientation, as measured by higher scores on a number of keys of the Strong Vocational Interest Blank, for instance, Architect, Mathematician, Physicist, Engineer.

Originality. There is an indication that those who show little displacement effect are somewhat more likely to be assessed as being what may loosely be called "original," as revealed in a correlation of  $-.32$  with a composite measure of originality ( $r$  equals  $-.32$ ), in the Unusual Uses Test from the Guilford battery of creativity measures, in the preference for complexity on the Art Scale, and in higher scores on the Strong Vocational Interest Blank keys for Artist, Musician, and Author-Journalist.

Ego-weakness and dependency. Those persons who exhibit large displacement errors tend to reveal themselves as weak and dependent in personality. For instance, there is a correlation of  $.50$  of displacement scores with a key of the Personal Preference Scale which is purported to measure "early oral" tendencies denoting dependency of personality.

Moreover, those with higher displacement scores are significantly lower in scores on the Ego-Strength scale of the MMPI, and in ratings of "resistance to authority" in a standard psychodrama situation.

Orientation toward others. In general, those who made larger displacement errors tend to express a greater involvement in and orientation

toward other people. Thus, they are rated by the assessment staff as more gregarious and socially participative, they are quicker in recognizing tachistoscopically exposed photographs of their fellow officers, they score higher on a key of the Personal Preference Scale purporting to measure identification with the weak and the handicapped, and they score higher on various keys of the Strong Vocational Interest Blank which pertain to socially oriented occupations, e. g., Public Administrator, Social Science High School Teacher, City School Superintendent.

The relatively few descriptive adjectives which significantly differentiate those high from those low in displacement effect confirm the above picture of orientation toward and dependent relationship with others. Thus, those who are markedly influenced by the distorting visual framework are more often described as affectionate, appreciative, cheerful, confused, considerate, simple, and tactful, while those who are unaffected by the frame are more often described as demanding, individualistic, masculine, and strong.

### Conclusions

These findings on the Perception of Vertical Test provide striking confirmation of the previous findings of Witkin and others that the tendency of judgment of the true vertical to be influenced by a tilted visual framework in darkness is expressive of important underlying trends in the personality, especially those having to do with dependency-independency themes in social, emotional, and cognitive spheres. As an approach to the detection and measurement of such important trends, this test procedure would seem to have considerable value.

### Line Movement Test

This test is a direct application to personality measurement of experimental methods developed many years ago by Wallach (10) in his studies of perception of visual movement. It consists in determining the threshold and rate of change of perceived movement of a pattern of lines in two alternate directions (vertical and horizontal) both of which are logically appropriate to the objective character of the visual stimulus pattern.

It was hypothesized that inasmuch as this test provides an approach to the measurement of perceptual flexibility or fluidity in shifting spontaneously among appropriate alternative forms of organization of a stimulus pattern, it would also reveal more central dispositions toward flexibility or fluidity in the psychological processes of the individual.

## Procedure

S was tested individually, sitting in a semi-darkened room about 10 feet in front of the apparatus.

A continuous paper belt was suspended vertically from a horizontal roller, driven by a constant-speed electric motor. The paper belt was 10 inches in width. On it were drawn 45-degree angle lines in India ink, sloping both from left to right and from right to left, so that a complete cross-hatching effect was produced. The lines were .7 inches apart. The paper belt moved downward at a speed of approximately 9.3 feet per minute. In front of the belt was set a large rectangular shield of white cardboard. A horizontal rectangular aperture nine inches wide by two inches high was cut in the shield, so as to expose part of the moving paper belt behind it. (See Figure 4.)

When the stimulus pattern is viewed through the aperture, all naive observers first perceive the crosshatched diagonal lines as a grid moving straight downwards. As inspection continues, there occurs sooner or later a sudden and unexpected shift in direction of movement; now it appears as though one set of the diagonal lines moves horizontally to the left and the other set horizontally to the right, the one set passing through or behind the other set. This phenomenon of sudden shift in direction of movement is the basis of the test measurement.

S was first shown the apparatus with the paper belt at rest. He was instructed that when the trial commenced he was to fixate the center of the aperture and keep fixating until the trial ended. During that time he was to describe continuously how the stimulus pattern looked to him and to report at once any unusual things he noticed. (Care was taken not to give S any hint as to the nature of the perceptual change that he would observe.)

Then the paper belt was put into motion and E began timing with a stopwatch. S was encouraged to continue to describe what he saw until that point came at which he reported the change in direction of movement from vertical to horizontal. E recorded the latency of this occurrence. If S had not reported the horizontal direction after a lapse of three minutes, he was aided by E to see it. Most subjects saw it spontaneously; all other subjects were readily able to see it after such aid.

As a second step, S was instructed to look at the moving pattern again for a period of two minutes and to announce each time the movement shifted direction, by saying "vertical," "horizontal," "vertical," etc. He was cautioned not to attempt to "force" the change but to allow it to occur naturally. E recorded the time for each change to occur.

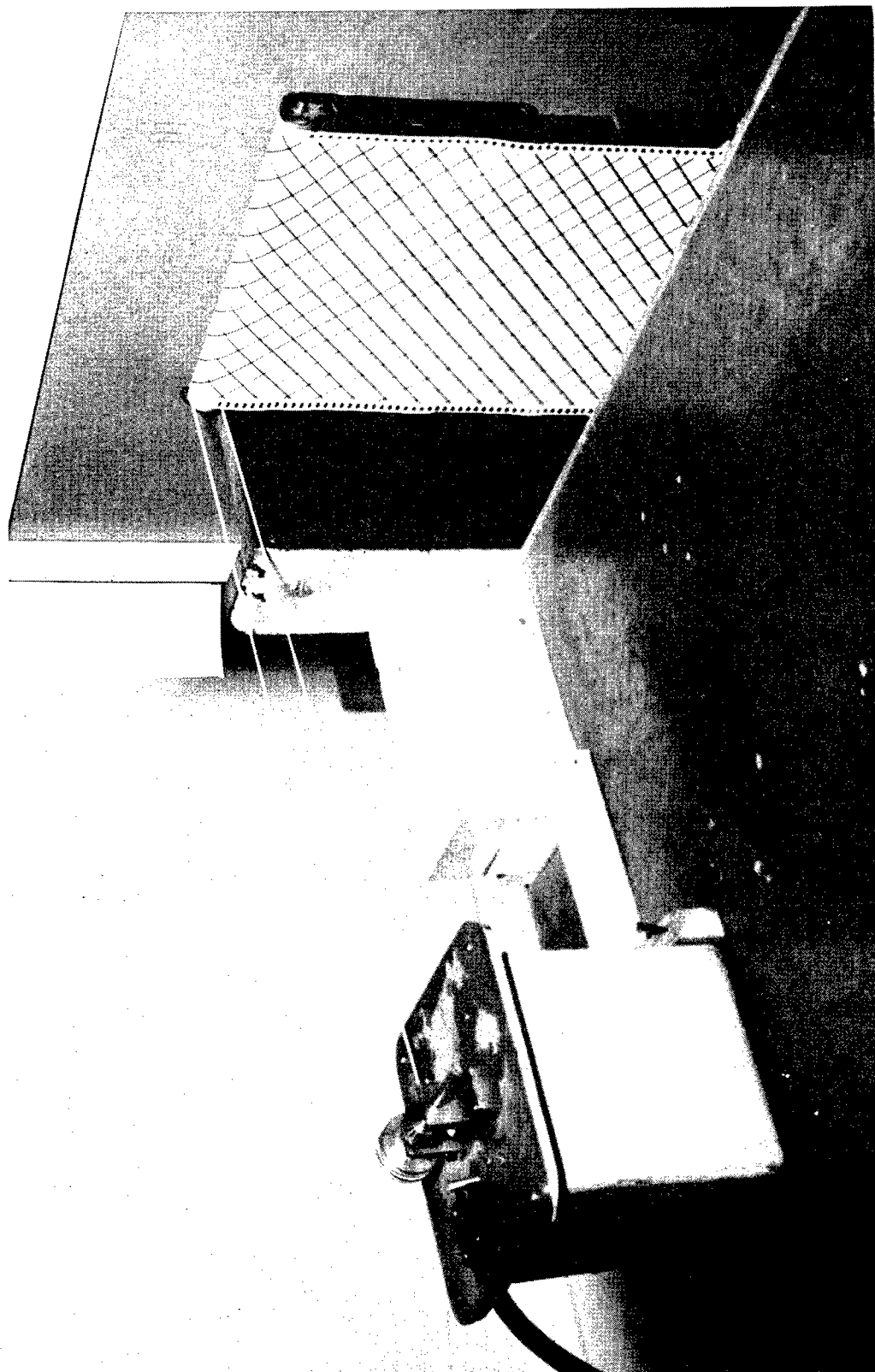


Fig. 4. The apparatus for the Line Movement Test, shown from the back.



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## Measures

Two measures were computed from the above data:

1. Threshold for perceiving horizontal movement. (Latency in seconds before spontaneous appearance of the horizontal direction. Ss who failed to see horizontal movement in three minutes were scored as 180.)
2. Number of fluctuations in direction. (Total number of reported changes from vertical to horizontal or vice versa in the two-minute period.)

Score distribution statistics for each of these measures are listed in Appendix B for 75 of the 100 officers, for whom the test procedure was conducted as described above.<sup>6</sup>

## Results

Threshold for perceiving horizontal movement. A low threshold for perceiving horizontal movement is most highly correlated ( $-.34$ ) with cognitive flexibility, the coefficient being negative as would be expected on theoretical grounds. Other cognitive variables which are negatively correlated are the Unusual Uses and Total Score of the Guilford Creativity Tests, the Minnesota Paper Form Board Test, and a measure of perceptual acuity in the Picture Recognition Test.

Other measures showing negative correlation with the perceptual threshold tend to reflect disturbances of psychological functioning, for example, the MMPI scales for Paranoia, Hypomania, and Schizophrenia, the CPI scale for impulsivity, the assessment staff's rating of constriction, and a scale measuring bi-modal ego-control.

Thus, relative quickness to restructure the ambiguous movement in the new direction appears to be associated with tendencies toward cognitive flexibility, and perhaps with emotional disturbance and neurotic trends. The assessment staff's adjective descriptions of these men substantiate

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<sup>6</sup>Test scores are missing for 20 officers reporting in the first two assessment groups when the procedure was not yet fully standardized, and for five officers whose assessment schedule did not allow time for the test.

the picture, for they are more frequently seen as aggressive, anxious, confused, fault-finding, high-strung, insightful, sensitive, suggestible, etc.

Positive correlates of the threshold for perceiving the horizontal movement include Naturalness (staff rating), a composite score on Soundness as a Person, the CPI Good Impression scale, mean confidence level in a subjective probability situation, and the magnitude of the correlation of descriptions of self and ideal-self on the Adjective Check List.

These correlational findings imply that greater persistence in the initial way of perceiving the ambiguous movement is associated with indicators of stability in the person as a whole. The adjectives ascribed to these men by the assessment staff bear this out--cool, natural, peaceable, reliable, sincere, stable, etc.

Number of fluctuations in direction. The number of fluctuations in direction of movement once the horizontal movement has first been seen is relatively independent of the threshold for the horizontal movement, the correlation of the two measures being only .15. Thus the two variables may be separately analyzed.

The variable showing highest correlation (.36) with this fluctuation measure is Promotion Board Ratings, which is a basic criterion measure of military effectiveness. Moreover, there is a significant positive correlation (.24) with another Air Force criterion measure, namely, Superior Officer's Rating. The man's own estimate of his suitability for the Air Force, which obviously may be a biased measure, also relates positively to this perceptual performance, the correlation being .25.

There is evidence from the correlational data that frequency of directional fluctuation tends to go with vigor, self-confidence, and masculinity. Significantly correlated in a positive direction are the officers' self-ratings on such variables as vigor, endurance, rate of recovery from illness, estimated length of life, and physical courage. Those men with higher fluctuation scores are rated in Improvisations as higher on social presence and poise, dominance, and participation. They earn higher masculine identification scores on the Personal Preference Scale. And a negative  $r$  with age at first intercourse seems consistent with their dominant masculinity.

The magnitudes of the test-retest and the self-ideal self correlations on the Adjective Check List, which are measures of constancy and favorability of self-appraisal, are also found to correlate positively with the measure.

The high-scoring officers also tend to score higher on the Word Rearrangement Test, on several CPI scales of intellect (Academic achievement, Intellectual efficiency, etc.), and on the IPAR scale P-IV, a measure of general effectiveness. On the other hand, they appear to be relatively low in preference for complexity (IPAR complexity--simplicity scale), in percent of color and whole responses on the Rorschach, in sense of humor (Q-item), and in psychological interests.

The adjectives used by the assessment staff to describe those very high in directional fluctuation also distinguish them in a favorable way from the officers who exhibit little frequency of fluctuation. The high-scorers are described as capable, confident, cool, methodical, responsible, shrewd, stable, etc. The low-scorers are described as confused, distrustful, gentle, leisurely, and suspicious.

In brief, the men who show a greater frequency of directional fluctuation in the Line Movement Test tend to receive higher Air Force criterion ratings, to see themselves in a consistent way as having those qualities necessary in an officer, and to be socially dominant and confident, intellectually efficient, masculine and vigorous. At the same time, there are indications that they tend to be relatively less differentiated and complex in their personality structures.

These findings are not easily interpreted. Why should such generally favorable attributes be associated with more rapid perceptual oscillation? One highly tentative interpretation is that what is being measured is the individual's characteristic way of handling the problem of stimulus changes. The self-confident, direct, and uncomplicated individual is able to respond more freely to the perceptual requirements for continuous oscillation of the stimulus-pattern. On the other hand, the person lacking self-confidence, poise and stability may tend, as a consequence, to inhibit the oscillation, thus maintaining a perceptual stability of the "outer" world as an adjustment to his own "inner" instability. Whether or not such an interpretation is justified can be determined only by further research.

### Conclusions

The Line Movement Test provides two measures of the individual's perceptual fluctuation in an ambiguous stimulus situation involving oscillation between two directions of visual movement. The two measures prove to be relatively independent. Each is significantly related to a number of personality variables.

The measure of spontaneous readiness to perceive the first horizontal movement of the lines is primarily associated with cognitive flexibility, and perhaps with emotional instability. The measure of frequency of directional oscillation of the movement is associated with several indicators of self-confidence, general effectiveness, and superior ratings on military criteria.

The test seems clearly to merit further development and validation for the assessment of personal effectiveness.

### Periscopic Tracing Test

This newly designed procedure provides measures of the individual's achievement of effective visual-motor organization under special conditions which interfere with the normal visual-motor relationships. The procedure had its inception in earlier experimental research on the autokinetic movement phenomenon (1). A new method and apparatus which were developed in that research to provide more precise measurements of autokinetic movement have been adapted directly to the present test procedure.

Essentially what is involved is that S views a simple luminous visual stimulus pattern through a periscope in darkness and attempts to "trace" the pattern on a vertical board placed at a short distance directly in front of his eyes. The critical feature of the task is that the "tracing" is done without being able to see the hand or the pencil; hence the visual cues which would normally guide such "tracing" are lacking, and the correct visual-motor organization can be expected to some extent to break down and be distorted.

Individual differences in the amount and the nature of such distortions are studied, the assumption being that they are related significantly to more general characteristics of the individual's manner of coping with difficult and unusual perceptual and cognitive situations in which performance may reflect such personality dimensions as fluidity-constriction, stability-instability, etc.

### Apparatus

The periscope arrangement consists of a system of two mirrors tilted at 45 degrees and an eye-piece which can be set by E so that S views the stimuli either monocularly or binocularly. A large vertical drawing board is mounted 16.5 inches in front of the periscope eye-piece. It is supplied with two electrically-driven rollers and a roll of newsprint

which gives a large drawing surface. By manipulating a switch, E can move the paper so as to provide a fresh tracing surface for each trial. The stimuli are exposed by use of a light-box. The box is placed at two different distances from S's eyes--229 inches (which is hereafter referred to as "distant") and exactly half that, or 114.5 inches (which is hereafter referred to as "close"). The level of illumination in the light-box can be adjusted as desired by E. (See Figure 5.)

The stimulus patterns, with one exception, are outlines of squares cut out of cardboard. One square is six and one-half inches in size and upright, another is 13 inches and upright, and a third is nine and one-half inches and tilted 30 degrees to the right. The one other stimulus pattern is the silhouette of the profile view of a man's head cut out of cardboard, approximately nine inches wide and 10 inches long.

### Procedure

Each S was tested individually. He was brought into a darkroom and seated before the apparatus. E instructed him on how to look through the periscope, explained the nature of the apparatus, and provided him with a pencil for tracing on the board.

The first stimulus pattern (the 13-inch square) was then exposed, and S instructed to "place" his pencil at the top left-hand corner of the square (i. e., to place it on the tracing board at a point which he estimated to be in the direct line of vision between his eye and that corner of the stimulus) and to "trace" the four sides in succession as accurately as possible without lifting the pencil from the paper. The paper roll was then turned to provide a fresh tracing surface, and the next stimulus pattern exposed with identical instructions.

Various stimulus conditions were used in the 14 successive steps. Some involved different stimulus patterns, others shifts in distance of the stimulus pattern from "distant" to "close," shifts from monocular to binocular viewing, and shifts in intensity of illumination of the stimulus patterns. At two points, S was further instructed to draw a vertical line through the immediately preceding tracing of a tilted square. The 14 steps were as follows:

1. Tracing 13-inch square; monocular; "distant."
2. Tracing nine and one-half inch tilted square; monocular; "distant."
3. Drawing vertical line through the previous tracing.
4. Tracing outline of man's head; monocular; "distant."

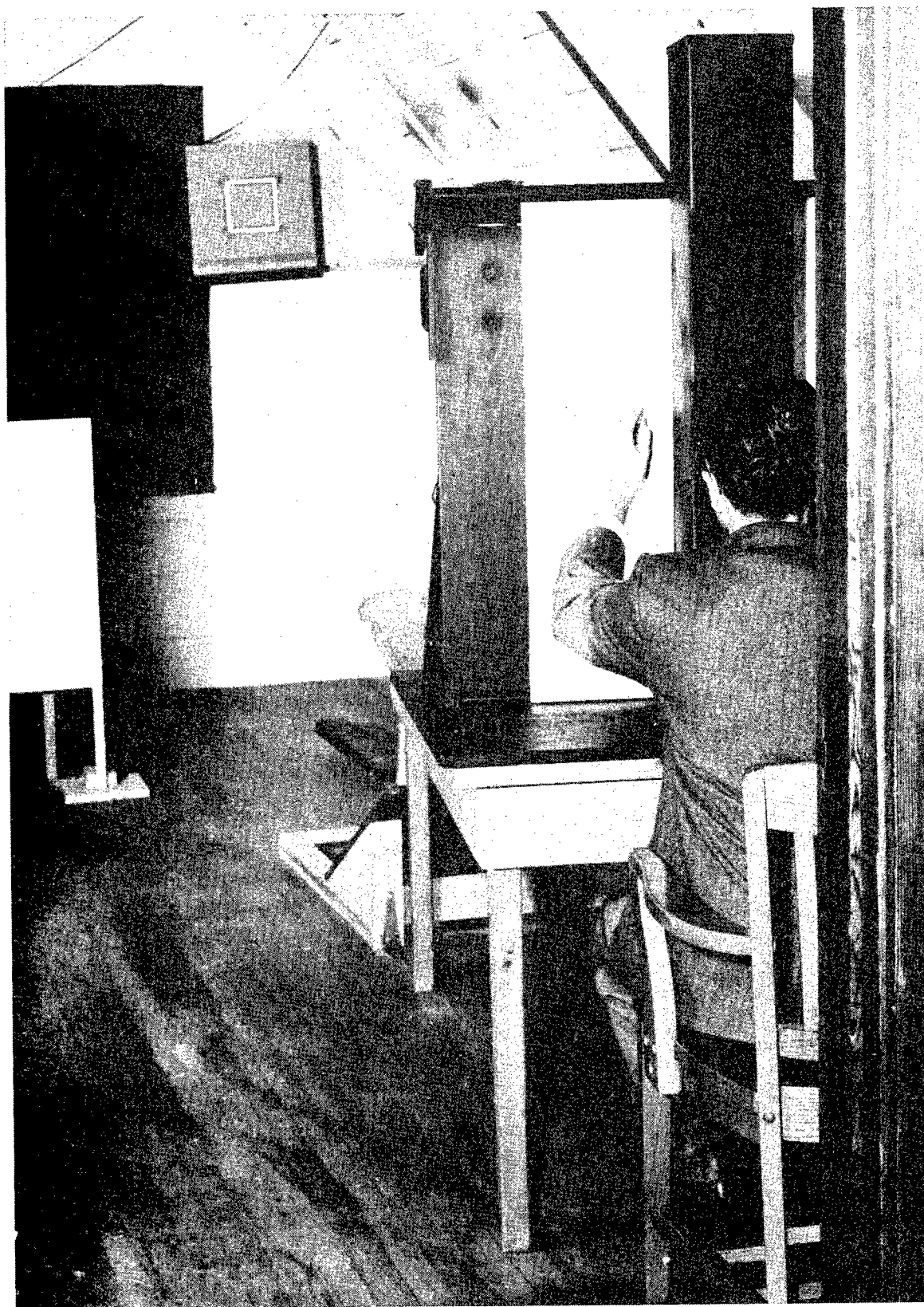


Fig. 5. Apparatus for Perisopic Tracing Test

5. Tracing six and one-half inch square; monocular; "distant."
6. Tracing six and one-half inch square; binocular; "distant."
7. Tracing six and one-half inch square; binocular; "close."
8. Tracing six and one-half inch square; monocular; "close."
9. Tracing outline of man's head; monocular; "close."
10. Tracing nine and one-half inch tilted square; monocular; "close."
11. Drawing vertical line through the previous tracing.
12. Tracing 13 inch square; monocular; "close."
13. Tracing 13 inch square; monocular; "close." bright illumination.
14. Tracing 13 inch square; monocular; "close."

### Measures

Various measures were derived from the data of the above 14 steps. Only the three most basic measures will be reported here.

1. Size of square. (Mean length of millimeters of the four sides of the square traced in step 1.)
2. Distortion of squares. (Average, for the ten tracings, of the coefficients of variation in length of the four sides of each square. A higher value thus indicates greater asymmetry in the tracings.)
3. Relational size judgment. (The ratio of sizes of the tracings of the 6.5 inch square "close" and the 13 inch square "close," expressed as a percentage. The correct value is 50; hence the greater the deviation from 50, the less relatively accurate the performance.)

Score distribution statistics for each of these measures are listed in Appendix B for the 67 of the 100 officers for whom the procedure was conducted as described above.<sup>7</sup>

The three measures prove to be relatively independent of one another. The correlation of size of square with distortion of square is .09, and with relational size judgment is .22. The correlation of distortion and relational size judgment is .01.

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<sup>7</sup>Test scores are missing for 20 officers reporting in the first two weeks of assessment during which the procedure was not yet fully standardized; and for 13 officers whose assessment schedule did not allow time for the test.

## Results

Size of squares. This measure appears to be one of special interest for the assessment of Air Force officers, for it shows significant correlations with six of the seven OER (Officer Effectiveness Report) variables. Most noteworthy is the correlation of  $-.36$  (significant at the  $.01$  level) with the OER Over-all Evaluation. This is, incidentally, the second highest correlation obtained between OER and any assessment variable.

Numerous other variables presumed to pertain to military effectiveness are also significantly related to the size of squares. Included are the Good Officer Index, the Criterion Index (composited of OER, Promotion Board Ratings, and Superior Officer Ratings), and an MMPI Fighter-Factor key, based on combat proficiency in Korea.

It is to be noted that these correlations are negative; those men who draw the smaller squares are the better rated. This constitutes an expression of more successful achievement of accuracy in the perceptual task, inasmuch as almost all of the errors in size of squares are over-estimates. We see, therefore, that superior achievement in the periscopic tracing parallels superior achievement in terms of several criteria of officer effectiveness. There are other indications, too, that the basic dimension running through this test performance is that of achievement drive and success.

Those officers drawing the smaller (more accurate) squares tend to be those who also achieve better in other perceptual tasks, such as perception of the vertical, and in various measures of social acuity. They demonstrate achievement drive in higher scores on the CPI College Attendance scale and the Specialization Level key of the Strong Vocational Interest Blank. They score higher on the Ego-Strength scale of the MMPI. And these officers tend to "make themselves felt" in social situations, as indicated by higher scores on the CPI Social Presence scale.

On the other hand, most of the descriptive adjectives ascribed to them--anxious, awkward, distrustful, immature, self-centered, sensitive, suspicious--indicate that along with their strong achievement orientations, those men exhibit certain unfavorable signs, especially of inadequate relations with other people.

To sharpen the contrast we may inspect some of the descriptive adjectives for those officers who draw very large squares. Included, for example, are appreciative, conventional, good-natured, obliging, patient, sincere, stable. Here the picture is a colorless one of easy-going and



amiable relations with others, rather than of the kind of aggressive drive that is often regarded as an essential component of military effectiveness.

Thus, the very fact that the high-scoring officers do exhibit drive and the ability to make themselves noticed and "felt" by others may largely account for their superior military criterion evaluations, despite certain other inadequacies of social relationship and adjustment that they manifest.

Distortion of squares. Under the difficult conditions in which the tracings are made, there is ample opportunity for tendencies toward psychomotor disorganizations and disturbances in the individual to manifest themselves in the "quality" of the tracing. Specifically we may hypothesize that the presence of disturbances of adjustment in the person will be correlated with asymmetry or distortion of tracings. This is borne out by the empirical findings.

A dozen Q-sort items and ratings are found to be significantly correlated with the degree of asymmetry of the tracings. They yield a picture of the man with a high distortion index as lacking naturalness, frankness and candor, sense of humor, and self-reliance; as being self-defensive, dependent on relatedness to others, and submissive to authority; as tending to become confused under stress, and to be "influenced in his behavior by diffuse personal feelings and intangible subjective facts."

Other assessment correlates show him to be poorer in social judgment less effective in social interaction, characterized by prejudiced beliefs and overly strict attitudes toward child-rearing practices, and lower in masculinity and personal soundness.

This consistently unfavorable picture associated with tendency toward distortion in tracing the squares is substantiated by the descriptive adjectives more frequently ascribed to these men: aloof, apathetic, awkward, cautious, dull, indifferent, mannerly, meek, mild, retiring, sensitive, sincere, slow, submissive, etc. Such terms are in marked contrast to those ascribed to the men who succeed in tracing very symmetrical squares, for example, alert, assertive, cheerful, confident, friendly, independent, individualistic, outspoken, practical, resourceful, serious, unaffected.

Relational size judgment. This measure pertains to the extent to which the individual achieves a ratio of sizes of tracings of two squares that approximates the correct ratio of the stimulus sizes. One square was exactly half the size of the other, hence the tracing of the smaller should

be exactly 50% the size of the tracing of the larger. Since all but two of the 67 officers had ratios above 50%, we may safely proceed on the assumption that the larger the ratio score, the poorer the perceptual achievement in the task.

The great majority of the significant correlations with assessment variables are negative, and hence it is convenient in discussing them to describe the officers with lower scores, that is, those who exhibit better perceptual achievement in the task. As we inspect the long list of negative correlations, it is manifest that they combine to give a very favorable picture. The lower-scoring subjects are clearly superior in effective intelligence, in social functioning, and in emotional adjustment.

Effective intelligence of these officers is demonstrated in test intelligence scores, such as the Concept Mastery Test and the Wesman Personnel Classification Test, and in cognitive flexibility and problem-solving ability, as demonstrated in scores on the Anagrams Test, the Word Fluency Test, the Guilford Creativity Tests, etc.

Effective social functioning of these subjects is especially evident in their performance in a standardized role-playing situation, in which they were rated as higher in poise, ability to communicate, readiness for effective compromise, dominance, etc. It is also revealed in staff ratings and Q-sort descriptions, for instance, effectiveness as a leader, being concerned with making a good impression, military and social presence.

Emotional adjustment is manifested in higher test-retest consistency of self-description and more self-insight, as measured on the Adjective Check List. It is also seen in staff ratings and Q-sorts of such qualities as being efficient and capable, and as having drive, poise, need for achievement, personal soundness.

The descriptive adjectives significantly more often ascribed to the lower-scoring officers are thoroughly consistent with the above picture: clear-thinking, clever, confident, cooperative, efficient, imaginative, masculine, outgoing, self-controlled, etc.

To accentuate the favorableness of the personality correlates of better perceptual achievement in this task, we can look at the distinctly unfavorable characterizations of those who do poorly as represented by adjectives, ratings, and Q-sorts. They tend to be viewed as having overt anxiety, lacking poise, being confused under stress, fearing possible future privations, and as awkward, commonplace, distrustful, peculiar, resentful, retiring, suggestible, weak, etc.

## Conclusions

The findings on the above three relatively independent measures derived from this Periscopic Tracing Test are such as greatly to encourage their further study for use in personality assessment. One of the measures (Size of squares) is significantly related to the kind of achievement drive which is associated with favorable military ratings; another (Distortion of squares) throws light on tendencies toward disturbances in emotional and social adjustment; a third (Relational size judgment) appears to measure aspects of effective intelligence, effective social functioning, and emotional adjustment.

## Tapping Test

In this test measurements are made of the individual's tapping tempo under several different instructional sets. That the procedure may in any degree be properly designated as a "perceptual" test stems from the fact that in addition to the more conventional measurement of tempo per se, it involves the subject's estimation of the tapping rates of other people. It is, therefore, partly a judgmental task in which perceptual and cognitive elements enter.

The reasoning governing application of the procedure is that simple tapping rates may reflect more general tempo characteristics of the person, which in turn may relate to variables of drive, emotionality, etc.

## Procedure

Each S was tested individually. He was seated at a table beside E and supplied with a stylus. The following instructions were given:

"Please take this stylus in your hand and tap on the table with it. Tap at what seems to you to be a comfortable rate, a neutral rate. Tap continuously until I tell you to stop. Now begin."

As S tapped, E counted and recorded the number of taps for a one-minute period.

After an interval of approximately 20 minutes during which S took part in two other procedures (the Size-Weight Illusion Test and the Line Movement Test), he was again asked to tap "at a comfortable, neutral rate, as before." Again E recorded the number of taps in a one-minute interval.

Then S was further instructed as follows:

"Now I shall ask you to tap again. This time please tap at a slow rate, that is, a rate that is about as slow as you would expect any of the officers in this study to tap when doing it as you just were, at a comfortable or neutral rate."

E recorded number of taps for a one-minute interval. As a final step, the following instruction was given:

"Now, finally, I shall ask you to tap at a fast rate, that is, a rate that is about as fast as you would expect any of the officers in this study to tap when doing it at what they considered a comfortable or neutral rate."

Once again E recorded the number of taps in one minute.

### Measures

Seven measures were computed from the four tapping trials described above. After examination of their interrelationships, the following three measures were chosen for intensive study:

1. Neutral tapping rate. (Total number of taps in the two 1-minute trials, under the instruction to tap at a "comfortable, neutral" rate.)
2. Slow tapping rate. (Number of taps in one minute, under the instruction to match the estimated rate of the slowest officer.)
3. Ratio: slow to fast rate. (Number of taps at estimated slowest rate divided by number at estimated fastest rate, expressed as a percentage. Higher value indicates smaller relative discrepancy between estimated slow and fast rates.)

Score distribution data for these three measures are listed in Appendix B for a group of 60 of the 100 officers, for whom the test procedure was conducted as described above.<sup>8</sup>

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<sup>8</sup>The missing officers either were assessed early in the program before this procedure was fully standardized, or had incomplete test records owing to shortage of time for administration of this procedure.

The correlations among the three measures are as follows:  $r_{12} = .63$ ;  $r_{13} = .15$ ;  $r_{23} = .57$ .

## Results

Neutral tapping rate. The individual differences in tapping rate under the instruction to tap at a "comfortable, neutral" rate are remarkably large, ranging roughly from 30 to 280 per minute, a ten-fold spread. The distribution is skewed, with more of the officers tapping in the slower range. The reliability of the measure is high, as estimated from the correlation of .90 between the tapping scores on the first and second one-minute trials.

The first striking thing to note about the significant assessment correlates of tapping rate is that faster tapping performance is associated with superior scores on a basic criterion of military officer effectiveness, the Promotion Board Ratings ( $r = .39$ ). It is also correlated with the Military Officer scale of the IPAR Questionnaire, an empirically developed criterion measure.

High rate of tapping in this motor performance clearly reflects general tendencies toward cognitive speed, flexibility, complexity, and readiness for change. This is shown in the numerous significant correlations with such test measures as the Concept Mastery Test, the Word Rearrangement Test, a composite index of originality, a test of preference for complex figures, and the Musician key of the Strong Vocational Interest Blank. It is shown, moreover, in several relationships with other perceptual measures which reflect cognitive flexibility. For instance, the faster tappers show more rapid loss in satiation on the Kinesthetic After-Effect Test, a greater readiness to shift adaptation level in the Weight Judgment Test, and a quicker disappearance of the size-weight illusion on repeated trials.

That certain social and emotional disturbances may go along with the fairly positive indicators noted above is seen in the fact that those with more rapid tapping rates show less identification with and desire to help others, less readiness to perceive human movement in inkblots, less self-acceptance, and elevated scores on the MMPI Hysteria scale.

The pattern of adjectives which significantly differentiate the faster from the slower tappers is consistent with this picture. The faster tappers tend to be described more often as complicated, dissatisfied, immature, impatient, stubborn, and tense. Conversely, the slower tappers tend to be seen as calm, deliberate, dignified, humorous, leisurely, loyal,

peaceable, pleasure-seeking, unexcitable. Paradoxically, the slower tappers are described as "versatile" and "original," although, as we have seen above, they do not perform this way.

It would appear that the very speedy tappers in this test situation are generally characterized by a higher level of "nervous energy," and that the very slow tappers tend to be easy-going. This difference in sheer tempo might help account for the obtained relationship with the Promotion Board Ratings on the assumption that officers with high tempo might be more easily and favorably noticed.

On the other hand, it merits special mention that inasmuch as this tapping performance was imbedded in an assessment setting, and more particularly within a very demanding test-situation, it is likely that the tapping rate of those officers characterized by strong drive and intense and nervous concern about performing well would tend to be accelerated in this procedure. Tapping rate ascertained in other less stressful contexts might not correlate with personality characteristics and criteria in at all the same way that we have observed above.

Slow tapping rate. This is a measure of the individual's tapping rate when he is attempting to match the neutral rate of what he would guess to be about the slowest tapper among his fellow officers. Under this instruction the tapping rates sharply decline, and there is a heavy concentration of scores at the low end; yet the range of individual differences remains large. That the correlation between this estimated rate and the person's own neutral rate is very substantial, an  $r$  of .63, indicates the partial operation of some sort of a generalized adaptation level of judgment in each individual which tends to lead him to conceive of the tempos of other persons on a scale anchored by his own neutral tempo. Yet the correlation is far from perfect, and this means that there are numerous instances in which there were sharp departures from one's own rate in estimating the rate of others.

As is true of the previous one, this measure relates significantly to several criteria of military effectiveness. The correlation with the Promotion Board Ratings is .30, that with an Officer Effectiveness Rating is .30, and that with a Criterion Index compositing three Air Force criteria is .26. Moreover, the measure correlates with the following additional variables which constitute research criteria of military effectiveness: Air Force Preference Inventory (Communality, .44, Leadership, .30, Intellectual Aptitude, .27); Good Officer Index, .34; IPAR Military Officer scale, .33.

The basis for these favorable relations with criterion measures may be found in part in the numerous correlations of this measure with various indicators of intellectual achievement: the Concept Mastery Test, the Bennett Mechanical Comprehension Test, the Insight Puzzles Test, the Arthur Stencil Test, the Potential Success scale of the Adjective Check List, the CPI scales of intellectual efficiency and academic achievement, etc.

We find further support for the favorable picture of the high scorers on this measure in the realm of emotional life and social relations. They tend to be rated well on social adjustment, on ease in interpersonal relations, and on absence of authoritarian attitudes. They score high on personal soundness and low on introspectiveness. In a subjective probability situation their confidence level remains stable. And of the relatively few descriptive adjectives found to differentiate the two extremes on this measure, those men giving very low estimates tend to be seen as prejudiced and narrow in interests, whereas men giving high estimates are seen as good-natured, honest, natural, organized, serious, sincere, sociable, warm, etc.

Ratio: slow to fast rate. This measure indicates the extent to which the individual's estimates of the slowest and the fastest tapping rate in others are close together or far apart. The higher the score, the more closely the two estimates coincide, and a score of 100% would mean that there was no difference at all.

The distribution of scores shows that there is an enormous range among the subjects, the scores varying from 4% to 84%. Thus, those near the bottom of the distribution conceive of a tremendous difference among fellow officers in tapping rates; those near the top conceive the difference to be relatively slight.

It would be a reasonable conjecture that this variable might reflect basic ways in which the person views differences and similarities between himself and others. For the officer who has a conception of fellow officers as not too different from himself, we might predict a pattern of personality characteristics involving stable outlook on self, good social adjustment and satisfactory identifications with his military group, and relatively little evidence of psychological complexity and differentiation.

These conjectures are well confirmed in the pattern of significant assessment correlates of scores on this measure.

The higher scoring officers demonstrate a positive, confident, and stable view of self as revealed in their self-descriptions on the Adjective

Check List. They score higher on the Self-Acceptance scale; they are higher in test-retest correlation, and are higher in correlation of descriptions of "real self" and "ideal self." They rate themselves as high in physical fitness and vigor. In a subjective probability task, the level of their mean confidence of judgment is higher and more stable.

The existence of these favorable attributes is supported by the ratings of the assessment staff. The high scoring officers are more likely to be rated as high in naturalness, ease in interpersonal relations, health and vitality, ability to obtain sexual gratification, moral character, and stability of present adjustment. As might be expected, the staff's adjective descriptions of these officers are of like character: cheerful, considerate, good-natured, honest, moderate, patient, responsible, simple, sincere, unassuming, etc.

To bring the contrast into sharp focus, we may inspect the significant negative correlates of the measure, which throw light on the characteristics of those scoring low on the measure, i. e., those who conceive of large differences in tapping rates among their fellow officers. Their self-rejection index on the Adjective Check List is higher ( $r = -.41$ ); they have elevated scores on a cluster of nine clinical scales of the MMPI ( $r = -.32$  with mean level of profile) especially on Hs, Pd, and Ma. They also are somewhat more complex and psychologically differentiated, as revealed in the interest maturity scale of the Strong Vocational Interest Blank, in the Plot Titles sub-test of the Guilford Creativity Battery, in a scale measuring Introspectiveness, and in lower susceptibility to the satiation effect in the Kinesthetic After-Effect Test and the distortion effect in the Perception of Vertical Test.

The unsatisfactory nature of their relationships with others is implied by the fact that they are more often rated as manipulating people as a means to achieving personal ends, and they are described by such adjectives as aggressive, arrogant, demanding, egotistical, opportunistic, and prejudiced. It is also noteworthy that having these asocial attributes and also being "active," "determined," "energetic," "nervous," etc., they should be expected to be especially visible to their associates. This expectation is confirmed by the fact that in the Picture Recognition Test in which the assessees' photographs are shown tachistoscopically, these men are more quickly recognized by their fellow officers.

## Conclusions

Despite its superficial simplicity, it would appear that the Tapping Test, as here developed, does have the potentiality of throwing light on



important aspects of the effective functioning of the individual. Taking together the various measures here discussed, significant relations are found with criteria of officer effectiveness, with cognitive speed and flexibility, and with social and emotional adjustment.

### Kinesthetic After-Effect Test

The work of Köhler and Wallach (5) and their associates on figural after-effects in perception appears to provide means for studying certain basic hypothesized attributes of cortical functioning. Their work also provides suggestive evidence of substantial and reliable individual differences in figural after-effects.

The present Kinesthetic After-Effect Test is based directly upon their procedures (4). It involves the measurement of distortions in kinesthetic perception produced by the "satiation" effects of prior kinesthetic stimulation, and the measurement of persistence of such distortions over time.

### Apparatus

The apparatus consists of four long plywood strips which are mounted on the edges of two tables with a space between them wide enough to permit S to stand between the tables and comfortably reach the strips with his left and right hands. At one end of the tables are mounted two strips which may be referred to as the "satiation" strips. They are approximately 65 centimeters long. The one on the left is 13 mm. wide, and that on the right is 63 mm. wide. They are mounted on thin supports in such a way that the edges of the strips can be grasped between thumb and fingers.

At the other end of the tables are mounted the "test" strips. The one on the left is approximately 183 centimeters long and is similar to the "satiation" strips; it has a width of 38 mm., which is exactly intermediate between their widths. The one on the right is a step-wise tapered strip, approximately 183 centimeters long. At its narrow end its width is 32 mm. At its wide end the width is 76 mm. There are 22 steps along the length, varying in width by steps of two millimeters. This tapered strip is so mounted that it may be readily slid into different positions along the table. In this manner S is prevented from getting local cues from his position within the room. The apparatus is shown in Figure 6.



Fig. 6. Apparatus for Kinesthetic After-Effect Test

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## Procedure

Each S is tested individually. After being blindfolded he is led to the apparatus and placed standing between the test strips. His left hand is placed so that the thumb and fingers lightly but firmly grasp the standard strip. His right hand is similarly placed grasping the tapered strip. S is then instructed to move freely forward and backward as he chooses keeping his hands parallel and trying to locate a width on the right which he judges exactly equal to the standard on the left. E records this judgment. Then S makes three additional judgments of the same kind, each time being started by E from a different position on the strips. These four judgments constitute initial "control" judgments.

Then S is moved backward several paces until he stands between the satiation strips. Each hand is placed properly so that his thumb and fingers lightly but firmly grasp the strip. He is then instructed to slide his hands forward and backward continuously along the strips. After exactly one minute of such "satiation," E moves S forward several paces until he is once again between the test strips of the apparatus. S makes four successive judgments, locating the position on the tapered strip which appears equal in width to the standard strip on the left. In each case, E starts S off by placing his hands at a new position on the strips.

During the next interval of 20 minutes S is occupied with an entirely unrelated task (the Arthur Stencil Design Test).

At the end of this period, S is once again blindfolded and returned to the apparatus, where he stands between the test strips and gives four successive judgments of equal width.

Then he is moved backwards and is once again "satiated" by rubbing the satiation strips continuously for a period of one minute. Immediately thereafter he is moved to the test strips and makes four final judgments of equal width. This terminates the procedure.

## Measures

The two logically most significant dimensions of the kinesthetic after-effect phenomenon are (a) degree of satiation-effect, and (b) extent of loss of satiation-effect over time. Pure measures of these dimensions are not easily obtained in this present test because of the confounding influences arising out of the particular psychophysical procedure used. Concretely, the difficulty is that there are large individual differences in the tendency to move one's hands freely along the strips from the point

at which the hands are initially placed by E. Thus, for some subjects the starting position exercises a considerable effect on the apparent amount of satiation, while for other subjects this effect is minimal. Even though care is taken to arrange the trials so that some starting positions are at the narrower end of the strip and others are at the wider end, it is technically difficult to insure a properly designed balance of the effects.

In light of this procedural limitation, it was decided that the expedient solution was to make an estimate of the so-called "position-influence" for each man, and to correct the satiation measures accordingly. Moreover, it seemed likely that there might be significant assessment correlations of the "position-influence" itself; therefore this measure was also included for further analysis.

The four measures are:

1. Absolute satiation-effect. (Absolute increment in millimeters from sum of four control judgments to sum of four judgments immediately following first satiation period. Larger value indicates greater satiation-effect.)
2. Absolute satiation-effect, corrected for position-influence. (Absolute increment in millimeters from sum of two control judgments to sum of two judgments following first satiation period, starting from identical positions on strip.)
3. Absolute loss in satiation-effect during rest period, corrected for position-influence. (Absolute decrement in millimeters from sum of two judgments immediately following first satiation period to sum of two judgments immediately preceding second satiation period starting from identical positions on strip. Larger value indicates greater loss in satiation-effect.)
4. Position-influence. (Difference between sum of two judgments made when started from extremely wide position on strip and the sum of two judgments made when started from extremely narrow position on strip. Larger value indicates greater position-influence.)

Distribution statistics of the scores on these four measures are listed in Appendix B for 90 of the 100 officers.<sup>9</sup> It is of some interest to

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<sup>9</sup>The procedure was not administered to the 10 officers in the first week of assessment.

note that the satiation-effect and the loss of satiation-effect during a rest interval are substantially related, the coefficient being .52. That is, for those who show a greater susceptibility to the satiation procedure there is also a tendency toward greater dissipation of the effect over time. It should also be mentioned that the position-influence is relatively independent of the two measures of satiation and satiation loss, the correlations being -.15 and -.06, respectively.

## Results

Absolute satiation-effect. Evidence from assessment correlations and from adjective descriptions indicates clearly that a greater degree of satiation-effect is associated with various unfavorable personality attributes, and that, conversely, a lower degree of satiation-effect is associated with many favorable attributes, especially those relevant to the requirements for effectiveness in military officers.

On evidence primarily drawn from assessment staff ratings and Q-sorts, it appears that the person exhibiting a high level of satiation tends to be a passive, suggestible individual who is weakly motivated, lacks dominance, self-assurance and leadership qualities, and is pessimistic about his future. His social skills and poise are underdeveloped. He tends to sidestep troublesome situations. He is slow in personal tempo and in intellectual processes. He is somewhat older than the average of the other officers.<sup>10</sup> At the other extreme, the officer who exhibits relatively little kinesthetic after-effect tends to be characterized by the assessment staff as possessing a constellation of traits centering on (a) drive, ambition, and competitiveness; (b) leadership, dominance, and ego-strength; (c) activity and efficiency; and (d) fluency of words and ideas, and ability to communicate.

Although the above pattern of ascribed traits is based on assessment staff ratings of the subjects, there is some amount of confirmatory evidence derived from objective tests. The traits of cognitive fluency, communicative ability, etc., are mirrored in superior performance of these subjects on Charades, on the Arthur Stencil Test, and on the Unusual Uses score of the Guilford Creativity Tests. The traits of ego-strength, competitiveness, etc., are mirrored in higher scores on the MMPI Ego-Strength

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<sup>10</sup>This finding of a positive correlation of satiation-effect with age ( $r = .30$ ) is interesting in light of Köhler's theoretical speculation that such a relationship should exist.

scale, and in the greater tendency to maintain one's own position in the face of group requirements for cooperation in the Bingo problem.

Absolute satiation-effect, corrected for position-influence. We have just seen that the foregoing measure of satiation-effect which is contaminated in some degree by position-influence, provides a considerable number of consistent relationships with other assessment variables. When the satiation measure is corrected for position-influence, this somewhat "purer" index of satiation-effect proves less discriminating among assessment variables. Very few adjectives significantly differentiating the high and the low scorers are found, and the significant correlations are small in number. It would appear, therefore, that doubt is cast upon the personological relevance of individual differences in kinesthetic satiability, per se. However, it must be acknowledged that the test methods here employed were far from technically satisfactory, in light of the confounding effect of the so-called position-influence, which is removable in these data only by rough statistical approximations such as we have employed. A better testing procedure, designed deliberately to eliminate such position-influences and to measure kinesthetic satiation more perfectly, might in further investigations be found to have greater relevance for personality assessment than that discovered here.

Of the limited number of significant correlates which do emerge most are in a direction such as to favor the low scorers on the satiation measure. Most may be readily classified under the heading of ability for cognitive reorganization, e.g., the Arthur Stencil Design Test, the Minnesota Paper Form Board, the Guilford Unusual Uses test, the spatial relations factor score, a staff rating on originality.

Absolute loss in satiation effect during rest period, corrected for position-influences. This measure, like the previous one, shows little systematic relationship with other assessment variables. Again, however, it should be noted that an improved procedure for measuring the satiation loss might give different results and different personality correlates.

Position-influence. This measure pertains to the extent to which the person's judgments are influenced by the different positions on the measuring apparatus from which he starts to try to locate the point of subjectively equal widths. The higher the score on this measure (i.e., the greater the amount of position-influence) the greater the discrepancy between judgments on trials which were initiated from opposite ends of the apparatus. Another way to view the position-influence score is as a measure of the tendency to keep the hands near to the point at which they are initially placed, in other words, as a measure of constriction tendencies.

A rather small list of adjectives significantly distinguishes those men high on the measure from those low. The highs are more frequently described as conventional, tense, conservative, dissatisfied, informal, and nervous. The lows are described as active, civilized, curious, imaginative, individualistic, mannerly, and obliging.

The list of assessment variables correlating significantly with the measure reveals a consistent and meaningful pattern, though none of the coefficients exceeds .30. By and large, it appears that susceptibility to position-influence is associated with unfavorable characteristics of the person. Thus, amount of position-influence relates to tendencies toward rigidity, narrowness, and social inhibition, as revealed in a staff rating of rigidity, a Q-sort item ("Has a narrow range of interests"), and Improvisations scale (Neurotic inhibition, social-verbal), slowness to perceive human movement in inkblots, and a pattern of interests consistent with this picture (Strong Vocational Interest Blank scales for Engineer, Purchasing Agent; CPI scale for Correctional Officers).

Looking at the other end of the dimension, we find the assessment correlates of relative absence of position-influence to cluster under the following headings:

(a) Social skill and outgoingness, such as leadership and dominance (staff ratings); social poise and presence, participativeness, benevolent dominance (revealed in Improvisations); ability to judge personality; capacity for mature social relations (Personal Preference Scale); interest in social interaction (Strong Vocational Interest Blank scales for School Superintendent, YMCA Secretary, Minister, etc.).

(b) Spontaneity and absence of constriction, such as fluency of ideas and breadth of interests (staff ratings); frequency of guesses and motility (Charades); expansivity (Improvisations).

(c) Personal effectiveness and maturity, such as ego-strength, stability, career satisfaction, good judgment, and over-all military effectiveness (staff ratings); Superior Officers' Ratings on conscientiousness.

In general, therefore, the data would appear to support the view that constriction of movement in this simple judgmental situation is a reflection of more generalized tendencies toward constriction in the person, for instance in the cognitive, social, and emotional spheres of functioning.

## Conclusions

The Kinesthetic After-Effect Test involves the measurement of distortion in kinesthetic perception produced by the "satiation" effects of prior kinesthetic stimulation, and the measurement of persistence of such distortions over time. Pronounced individual differences in both these dimensions are found.

On the other hand, pure measures of the dimensions were not satisfactorily achieved in this study because of the confounding influences arising out of the particular test procedure. Most of the difficulty occurred in connection with the effect of various locations of the starting position of the hands and with the individual differences in freedom of movement of the hands on the test strips.

Despite this shortcoming, and partly by virtue of capitalizing on it, we find that two measures of the test--the uncorrected satiation-effect, and the position-influence--offer promising leads in the assessment of personality. Both are significantly related to aspects of effective personal functioning, such as leadership, good social relations, maturity, and spontaneity.

## Street Gestalt Test

This test consists in the presentation of incomplete pictures of real objects which the person is to identify as rapidly as possible.

The pictures are those originally developed by Street (8). They are black silhouettes on white background. Parts of each picture have been deleted, resulting in what appears at first sight to be a mere meaningless scattering of unrelated black shapes of irregular size and form. (See Figure 7.) The difficulty in achieving a correct perception of the whole object is because the deletions are deliberately made in such a way as to disrupt the natural perceptual organization of the picture parts. The relative difficulty of recognition of a given picture depends upon the degree of perceptual disorganization which has been produced in this way.

The test may be presumed to reflect the individual's ability to arrive at a correct perceptual synthesis and organization of partial cues, and as such, to throw light on more general cognitive organizing functions in the person, e. g., whole vs. part tendencies, closure tendencies, etc. Particularly, in view of the fact that many of the pictures are difficult and the exposure times are short, the test performances may be expected to reflect individual differences in effective achievement drive.



## Procedure

Ss were tested in groups of five. The 20 drawings were on slides which were projected on a wall approximately 14 feet in front of the Ss. They were supplied with record sheets on which to write down their guesses about the identity of each picture. They were instructed to continue to inspect the picture for as long as exposed and to write down all their guesses. It was emphasized that the pictures were all of real objects and that the test was not a test of imagination.

The 20 pictures were as follows:

- |                     |                          |
|---------------------|--------------------------|
| 1. dog (front view) | 11. table                |
| 2. boy's face       | 12. man with beard       |
| 3. tennis player    | 13. rabbit               |
| 4. dog (side view)  | 14. knight on horseback  |
| 5. flight of ducks  | 15. boy on tricycle      |
| 6. sprinter         | 16. baseball pitcher     |
| 7. couple dancing   | 17. hawk                 |
| 8. team of horses   | 18. locomotive           |
| 9. baby             | 19. boy and girl walking |
| 10. washerwoman     | 20. cameraman            |



Fig. 7. Sample stimulus for Street Gestalt Test

The series of slides was presented three times. On the first trial, the exposure time was three seconds per slide. On the second trial, the exposure time was five seconds per slide. On the third trial, the exposure time was 30 seconds per slide, but only the eight most difficult pictures were presented, namely, numbers 3, 6, 8, 12, 13, 16, 18, and 20. The time interval between slides on all trials was approximately 10 seconds.

### Measures

In scoring, two points were assigned to each slide for which a correct response was made; one point was assigned to a response which was a fairly close approximation to the correct answer, though not entirely correct, e.g., calling slide 16 a "football player," instead of a "baseball pitcher."

Each individual's score was determined by summing the points earned on the 20 slides. Credit was given for a slide no matter on which of the three trials it was correctly identified, but credit was given only once for each slide. Hence, the maximal possible score on the test is 40. Inasmuch as certain refinements in procedures were introduced following the first week's assessment of ten officers, the statistics for the Street Gestalt Test pertain to only 90 of the 100 officers. The range in scores is considerable, being from 11 to 34, with a mean of 24. The split-half reliability of the scores is above .90.

### Results

Performance on the test is significantly correlated with 115 other assessment variables at the .05 level of significance; of these 38 are significant at the .01 level of significance. The great majority of the significant relationships refer to variables which can be subsumed under the heading of effective functioning, as displayed in intellectual processes, emotional and motivational makeup, and social relations.

The largest number of significant relationships pertain to measures of intellectual capacity and achievement. Higher scores on the Street Gestalt Test go with measures of intellectual functioning drawn from diverse assessment procedures--paper-and-pencil tests, personality inventories, staff ratings, problem-solving tasks, psychodrama performance, etc. Men who score high demonstrate superior verbal and spatial relations ability, fluency of ideas and ability to communicate them, flexibility in approaching problems, and originality in general. They tend to be well informed and to display wide interests.

With respect to emotional and motivational makeup, high scoring officers exhibit a generally more favorable pattern of attributes than do the poorer perceivers. Data from ratings, tests, and inventories indicate that they tend to have more self-confidence, independence and self-reliance, ego-strength, and personal courage. They are rated higher in career and work satisfactions, scope as persons, and adaptive flexibility. They tend to be "counteractive in the face of frustration." Their strong drive toward status and achievement is indicated by higher scores on a pattern of relevant dimensions of the Personal Preference Scale, including the "phallic" scales.

In the sphere of social relations, also, the individuals with higher Street Gestalt scores seem to excel. They tend to be characterized as having more persuasiveness, leadership ability, ascendant behavior and initiative in interpersonal situations, social poise and presence, and participativeness. They are superior in social judgment. They are more likeable (staff rating). They are at ease in interpersonal situations, showing greater motility in Charades and expansiveness in Improvisations. And consistent with their orientation toward and effective relations with others is the finding that they perceive a greater volume of human movement in the inkblot test.

In light of the above findings, it is not surprising that the Street Gestalt Test scores should bear some relationship to indicators of military officer effectiveness. Positive correlations of modest size are found with the following:

Air Force Preference Inventory: Military officer performance, and Communality

Staff ratings: Over-all military effectiveness in staff and command functions; military and social presence; positive valuation of the military identity

Good Officer Index

The consistently favorable picture of the high scorers on the Street Gestalt Test is also reflected in the descriptive adjectives assigned by the assessment staff significantly more frequently to these men than to the poor performers. The adjectives descriptive of the high scorers are as follows: active, alert, ambitious, capable, clear-thinking, determined, efficient, enterprising, individualistic, intelligent, interests wide, organized, poised, resourceful, stable, etc.

The relevance of the perceptual performance to various dimensions of effectiveness can be emphasized by looking at the opposite end, namely, at the descriptions of the men who perform poorly in the task. The adjectives assigned significantly more often to these men by the assessment staff are: apathetic, awkward, commonplace, confused, conventional, dull, easy-going, evasive, indifferent, inhibited, interests narrow, irresponsible, peculiar, quiet, retiring, silent, simple, slow, submissive, suggestible, timid, unassuming. Finally, the numerous Q-sort items which are significantly correlated in a negative direction with Street Gestalt Test scores add to this unfavorable picture of the low scorer:

Fears possible future privation; anticipates being exploited and cheated.

Is stereotyped and unoriginal in his approach to problems.

Is rigid; inflexible in thought and action.

Tends not to become involved in things; passively resistant.

Has a narrow range of interests.

Lacks confidence in his own ability.

Is pessimistic about his own professional future and advancement.

Is unable to make decisions without vacillation, hesitation, or delay.

Is apt to be misunderstood by others.

Lacks social poise and presence; becomes rattled and upset in social situations.

Has slow personal tempo; responds, speaks, and moves slowly.

### Conclusions

Performance on the Street Gestalt Test is found to relate significantly to numerous measures of effective functioning of the person, as displayed in intellectual processes, emotional and motivational makeup, social relations, etc.

The test, therefore, offers considerable promise as an assessment device, especially in light of the ease, brevity, and economy of its administration.

### Gottschaldt Figures Test

This test, developed in its present form by the senior author, is intended to measure the ability of the individual to locate simple geometrical figures which are camouflaged by being imbedded in more complex figures. Some of the figures used are borrowed from the experimental research of Gottschaldt (2) many years ago; others are newly constructed. Among other variants of the Gottschaldt figures are tests developed by Thurstone (9) for his factorial study of perception, and Witkin (11) for his study of personality.

The test may be presumed to reflect facility in breaking apart a strong whole perceptual organization in order to isolate a required part. Hence, it may be expected to relate to individual differences in analytical ability and other aspects of cognitive functioning having to do with "separation of systems." A substantial spatial relations ability factor is obviously involved in the test. Moreover, as a consequence of the stringent time limitations imposed on the difficult task, performance may be expected to reflect in some degree the characteristic manner in which the individual's cognitive processes are impaired by stress.

### Procedure

The test is group administered. The printed test booklet has two parts, each of which consists of 10 complex figures in each of which one or the other of two simple geometrical figures is imbedded. (See Figure 8.) The task is for S to find and trace each imbedded simple figure as rapidly as possible. The time limit is 2 minutes 15 seconds per part. Care is taken to insure that S fully understands the nature of the task before he proceeds, and a sample figure is shown him in advance. In between the two parts, a short rest pause is given.

### Measures

In scoring, one point is awarded for each correct tracing. No credit is given for partially correct tracings. The carefulness of the tracing is not considered; the only critical consideration is whether the simple imbedded figure has been properly identified and located.

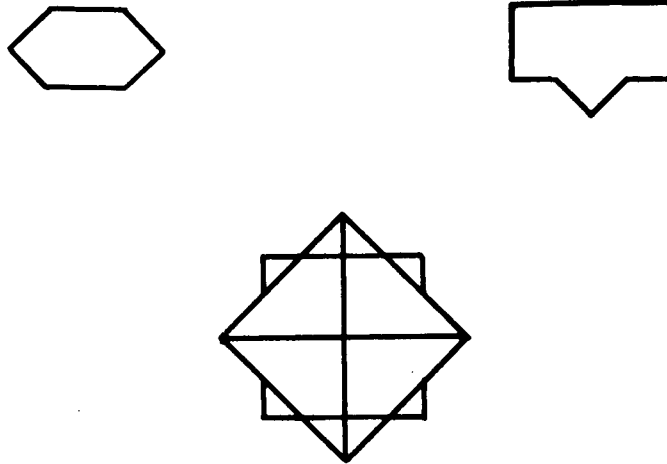


Fig. 8. Sample stimulus for Gottschaldt Figures Test. The subject is told that one or the other of the two simple figures at the top is to be found in the more complex figure below.

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Part scores are obtained for the first ten and for the second ten figures. The total score is the sum of these two part scores. The total score may therefore vary from zero to 20. It is noteworthy that the obtained scores spread over the entire possible range, varying from zero to 20. The distribution is fairly symmetrical with a mean close to 10. Inasmuch as there are appreciable numbers of scores close to both extremes, it is evident that the test could be improved by the addition of both easier and harder items.

The correlation between the part scores for the first and second halves of the test is .64. This falls far below a reliability estimate based on a split-half correlation for the entire 20 items. There is an appreciable tendency for individuals to perform better on the second half than on the first. A likely inference is that such improvement reflects the dissipation of stress which usually occurs at its height during the beginning part of the task. Thus it may be useful to compute a measure of this relative shift, on the assumption that it might correlate with other aspects of the handling of stress by the individual. Such a measure has been developed in other applications of our test, but it will not be reported upon here.

This discussion will be restricted to the correlates of the total test score.

## Results

Relation to a spatial reorganization factor. As a preliminary step in analysis before the usual study of assessment correlates, the Gottschaldt Figures Test scores were included in a factorial analysis of a battery of assessment tests purported to measure the ability of spatial reorganization. From among the entire list of assessment tests there was first a selection of those which on an a priori basis were judged to relate most logically to such a spatial reorganization ability. The seven tests chosen were: the Insight Puzzle Test, the Masked Word Test, the Arthur Stencil Design Test, the Minnesota Paper Form Board, the Guilford Match Problems, the Guilford Gestalt Transformations, and the Gottschaldt Figures Test.

The matrix of intercorrelations of these seven tests was inspected for obvious factorial structure. Four of the tests had intercorrelations high enough to be considered a "cluster." These were the Insight Puzzles Test, the Arthur Stencil Design Test, the Minnesota Paper Form Board, and the Gottschaldt Figures Test. The matrix of intercorrelations of these four tests is shown in Table 4.

TABLE 4

Intercorrelation Matrix of Four Spatial Reorganization Ability Tests

	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>
1. Insight Puzzles Test	---	.57	.41	.39
2. Gottschaldt Figures Test	.57	---	.57	.53
3. Arthur Stencil Design Test	.41	.57	---	.45
4. Minnesota Paper Form Board	.39	.53	.45	---

This matrix was factored by the Thurstone method and a single factor was found to account for essentially all of the original correlation, the first residual correlations ranging from .07 to -.07. The loadings of the four measures on this first factor arranged in order of magnitude were as follows:

Gottschaldt Figures Test	.788
Arthur Stencil Design Test	.703

Insight Puzzles Test	.682
Minnesota Paper Form Board	.668

The very high loading of the Gottschaldt Figures Test scores on this factor points to its potential usefulness as a single indicator for the spatial reorganization ability measured by these four tests.

Personality correlates. That such a measure relates meaningfully to important variables of personality is made manifest by the extremely numerous significant correlations of the Gottschaldt Figures Test scores with other assessment measures. Altogether there are 128 correlations significant at the .05 level; 73 of these are significant at the .01 level.

Looking first at correlations with objective tests, scales, etc., the striking association of Gottschaldt scores with a wide array of measures of effective intellectual functioning is seen. The relationships with standard mental tests are high, e. g., Terman Concept Mastery Test (.34), Wesman Personnel Classification Test (.43), Bennett Mechanical Comprehension Test (.53), etc. So are the relationships with diverse indicators of cognitive flexibility and insightfulness, e. g., Insight Puzzles Test (.57), Guilford Creativity Tests, Total Score (.26), etc. Factor scores on four dimensions of intellectual efficiency all correlate significantly with Gottschaldt scores, as follows: spatial ability, .80; problem-solving ability, .71; verbal intelligence, .44; "phenotypic" intelligence, .27.

But that there is another important dimension involved in the Gottschaldt performance, only partly related to the intellectual capacity of the person, is seen in a pattern of significant correlations with measures of emotional adjustment. Those scoring high on the test tend to get higher scores also on various indices of ego-strength, self-acceptance, emotional freedom, etc. And, conversely, those who obtain low Gottschaldt scores tend to show emotional disturbances, indicated for example, in the repression and the anxiety scales of the MMPI, in the self-rejection score on the Adjective Check List, and in elevated scores on the hypertensive personality syndrome.

The above findings based on purely objective tests are substantiated and extended by the findings on staff ratings, Q-sorts, etc. The men who achieve high scores on the Gottschaldt Figures Test are more likely to be described by high ratings of: intellectual competence, verbal fluency, ability to communicate, adaptive flexibility, breadth of interests, fluency of ideas, good evaluation of ideas, fairmindedness, good judgment, originality, likeability, and over-all military effectiveness. Certain additional Q-sort items add to this favorable picture:



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Highly cathects intellectual activity.  
Is concerned with philosophical problems.  
Seeks and enjoys aesthetic and sensuous impressions.  
Is introspective.  
Is socially perceptive; responsive to interpersonal nuances.

And in vivid contrast, the men who achieve very poorly on the test are more likely to be described in such unfavorable Q-sort items such as these:

Has a narrow range of interests.  
Is rigid; inflexible in thought and action.  
Allows personal bias, spite or dogmatism to enter into his judgment of issues.  
Is stereotyped and unoriginal in his approach to problems.  
Is pedantic and fussy about minor things.  
Is unaware of his social stimulus value.  
Lacks insight into his own motives and behavior.

### Conclusions

The Gottschaldt Figures Test is a simple, brief, group-administered procedure which confronts the subject with a task of locating simple geometrical figures that are camouflaged by being imbedded in complex figures. It was hypothesized that performance on the test would relate significantly to basic dimensions of intellectual functioning of the person, especially those involving flexible and insightful reorganization of cognitive materials. This expectation was strongly confirmed by the assessment findings.

It was further hypothesized that inasmuch as the difficult task is carried out under the pressure of very short time limits, performance should also relate to emotional characteristics of the person having to do with susceptibility to stress. This, too, was clearly confirmed in the results. Poor test scores are the function of more than mere limitation in intellectual capacity; they also reflect characteristics of emotional constriction, rigidity, and anxiety in the person.

Effective intellectual achievement involves among other things a combination of cognitive capacity and of freedom from emotional stress. The Gottschaldt Figures Test appears to provide a happy combination of measurements of both these factors, and hence offers considerable promise as a device for the assessment of the effective person.

## SUMMARY AND CONCLUSIONS

In what manner are individual differences in perceptual functioning associated with differences in personality characteristics? Do style and effectiveness of perceptual test performance relate systematically to style and effectiveness of other aspects of the person's behavior? Do perceptual tests provide useful instruments for assessing the personality of the individual? This study is directed at such questions.

The setting for the study was an intensive assessment of 100 Air Force officers of the rank of captain. Included in the wide array of assessment procedures were the 10 perceptual-cognitive tests discussed here. Some of these perceptual tests were adapted from previous research studies; the rest were specially created for this study.

On each test the 100 officers were scored on one or more measures, each of which exhibited substantial individual differences in performance. Each test measure was systematically correlated with all of the more than 600 other scores obtained in the assessment pertaining to intellect, interests, emotional adjustment, social relations, personality structure, life history, etc. Each perceptual measure was also compared with certain Air Force criterion measures of the military effectiveness of the officers.

In general, the findings establish that there are numerous and consistent relationships between perceptual performance and the personality characteristics and behavior of the individual. The magnitude of the relations is moderate, with the largest correlation coefficients in the range from .40 to .50. The variations in magnitude of those correlations make it clear that the different kinds of perceptual tests differ in the particular aspects of personality and behavior with which they are associated.

This brief summary cannot adequately describe all the specific relations of perceptual and personality variables which are fully discussed in the body of this report. However, a very rough picture of the types of relationships found can be provided by Table 5 which indicates the various areas of personality functioning and behavior with which each of the reported test measures was significantly related.

The table is divided into eight areas which are arbitrarily chosen to constitute certain roughly differentiable aspects of personality and behavior. Some, e.g. social relations and leadership, are mainly interpersonal; others, e.g. cognitive flexibility and ego strength, are intrapersonal.

TABLE 5

Summary of Obtained Relationships Between Perceptual Tests  
and Measures of other Areas of Personality and Behavior

Perceptual Test	Effective Intel- ligence	Cognitive Flexi- bility	Ego Strength	Personal Adjust- ment	Social Rela- tions	Impulse Control	Leader- ship & Domi- nance	Military Effect- iveness
1 Size-Weight Illusion Test								
a Mean illusion, 12 trials	X							
d Carry-over of illusion		X		X		X		
2 Weight Judgment Test								
b Shift in adaptation level		X	X	X	X	X		
3 Progressive Squares Test								
a Inflexibility in readjustment of adaptation level	X	X			X			
b Inconsistency of judgments			X	X		X		
4 Perception of Vertical Test	X	X	X					
5 Line Movement Test								
a Threshold for perceiving horizontal movement		X	X	X		X		
b Number of fluctuations in direction			X				X	X
6 Periscopic Tracing Test								
a Size of square			X		X		X	X
b Distortion of square				X				X
c Relational size judgment	X	X	X	X	X			
7 Tapping Test								
a Neutral tapping rate								X
b Estimated slow rate	X	X		X				
c Ratio: Slow to fast rates			X	X				

Table 5 (Continued)

Perceptual Test	Effective Intel- ligence	Cognitive Flexi- bility	Ego Strength	Personal Adjust- ment	Social Rela- tions	Impulse Control	Leader- ship & Domi- nance	Military Effect- iveness
8 Kinesthetic After-Effect Test								
b Absolute satiation effect corrected for position influ		X						
c Absolute loss in satiation effect during rest period corrected for positioninfluen		X		X				

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For each test measure, an X inserted in the appropriate cell indicates that correlations show a consistent pattern of significant relationships, involving a number of relevant variables. Greater weight was given to objective test measures; ratings and other qualitative impressions when unsupported by objective measures were not alone considered sufficient evidence.

Inspection of the table shows that well over one-third of the cells have Xs. The various perceptual measures differ markedly in the extent to which they relate to the several areas. Some apparently relate narrowly to only one or two areas, whereas others, e. g. the Street Gestalt Test, have a remarkably diverse set of relationships. It should be emphasized, of course, that this rough tabulation reflects nothing about the relative intensity of the relationships, nor their directions. Some measures have powerful relationships in certain areas, and relatively weak ones in others.

It may be noted from the table that in some areas all or most of the perceptual tests show relationships, whereas in other areas, only a few are found. However, it should be stressed that the areas are not at all comparable in their size and nature. All that is intended by this very crude tabulation is to indicate the general topography of the various specific relationships discovered.

Clearly, the perceptual tests are most strongly related to the areas of intellect and cognitive-flexibility, which is what we should expect. But it is also noteworthy that for such areas as emotional adjustment, social relations, and leadership, numerous significant relationships are found.

It also appears that the specific nature and direction of the "perception-personality" relationships tend to correspond with what would be expected on the assumption that basic personality trends are general in nature and should manifest themselves in an analogous manner in perceptual and other forms of behavior of the person. Thus, for example, a perceptual performance which reveals susceptibility to illusion is found to be associated with a more general "trait" of suggestibility as measured in quite different ways. For another example, a perceptual performance which is characterized by a rigid, inflexible style of responding to stimuli is found to be associated with generally rigid, inflexible trends in other aspects of the person's behavior. And for still another example, performance on those perceptual tasks which particularly emphasize successful task achievement is found to be associated with superior achievement by the individual in other aspects of behavior.

This last example is especially relevant in connection with the assessment of Air Force officers in which there is interest in the discovery of measurement techniques that may be predictive of effective military functioning. Several of the perceptual tests are found to provide significant correlations of moderate size with independent criteria of Air Force officer effectiveness, e.g. Promotion Board Ratings. And virtually all of the perceptual tests are found to contribute in some manner to the measurement of those general traits of the effective and superior person that are demanded in the military officer.

The results of the study must be interpreted with several critical qualifications in mind. First and foremost, it should be recognized that most of the obtained relationships have not yet been cross-validated. Because of the nature of this study, involving a large scale systematic search for significant correlation coefficients, a certain number of the statistically significant relationships undoubtedly have occurred by "chance." Yet the sheer number and consistent pattern of obtained relationships is such that we must conclude that the majority of findings indicate genuine relationships. Moreover, some few of the findings have been cross-validated in other studies.

Second, it should be recognized that these findings have been obtained in a particular kind of assessment setting, in which the officers were ordered to take part and which was doubtless perceived by them as bearing intimately upon their military careers. Whether such findings would hold true for motivationally quite different kinds of assessment atmospheres, or for performance measured in the psychological laboratory, is something that only further research can tell. Obviously there are both practical and theoretical questions related to this. As to practice, it is important to know such things as whether a given perceptual procedure could be included as a diagnostic device in a routine test battery and still give the same results. As to theory, it is important to know the extent to which test situational factors account for the observed relationships.

Finally, it should be stressed that this kind of study simply prepares the empirical groundwork for a theoretical attack on the problem of relating perceptual functioning and personality. Each of the single significant relationships discovered in this study requires a program of research in itself, if we are to come to understand the essential psychological processes involved. The study does clearly provide data that challenge such theoretical inquiries. And the study would seem clearly to establish the fruitfulness of the inclusion of perceptual tests in the assessment of personality and effective functioning of the individual.

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## **APPENDIX A**

### **List of Assessment Procedures**

#### **Personality Questionnaires and Inventories**

- Strong Vocational Interest Blank
- California Psychological Inventory
- IPAR Questionnaire
- Minnesota Multiphasic Personality Inventory
- Inventory of Personal Philosophy
- Air Force Preference Inventory
- Adjective Check List
- Biographical Data Sheets
- Personal Preference Scale
- University of California Public Opinion Scales
- Cartoon Test

#### **Projective Tests**

- Thematic Apperception Test
- Rorschach Psychodiagnostic
- Rorschach Concept Evaluation Test
- Test for Perception of Human Movement in Inkblots

#### **Tests of Originality and Creativity**

- Word Rearrangement Test
- Barron-Welsh Art Scale
- Guilford Creativity Tests

#### **Tests of Cognition and Intellectual Functions**

- Bennett Mechanical Comprehension Test
- Minnesota Paper Form Board
- Concept Mastery Test
- Wesman Personnel Classification Test
- Idea Classification Test
- General Information Survey

#### **Experimental Tests of Perceptual and Cognitive Performance**

- Size-Weight Illusion Test
- Weight Judgment Test
- Progressive Squares Test
- Perception of Vertical Test
- Line Movement Test
- Periscopic Tracing Test
- Tapping Test
- Kinesthetic After-Effect Test



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## Appendix A (Continued)

- Street Gestalt Test
- Gottschaldt Figures Test
- Arthur Stencil Design Test
- Insight Puzzles Test
- Masked Word Test
- Anagrams Test
- Word Fluency Test
- Picture Recognition Test
- Test of Decision Behavior

### Tests of Social Insight and Empathy

- Chapin Social Insight Test
- Opinion Prediction Scale
- Kerr Empathy Test
- Social Acuity Test

### Situational Tests

- Interview with Officer Recorded on Sound Film
- Discussion I: Critique of Officer Evaluation
- Discussion II: Group Q-Sort for Ideal Air Force Officer
- Charades
- Improvisations
- Quasi Group-Interaction Situation: "Bingo"
- Group Pressure Test

### Life History Interview

### Medical (Physical) Examination and History

### Staff Evaluations

- Adjective Check List
- Q-Sort Descriptions
- Ratings
- Graphological Rankings

Score Distribution Statistics for Variables Derived  
From Perceptual Tests

APPENDIX B

Variables	N	M	SD	Score Range
1. Size-Weight Illusion				
a. Mean illusion averaged over 12 trials (minus 300, divided by 20)	90	20.94	16.00	0 to 94
b. Change in illusion, trial 1 to 12	90	50.90	8.04	23 to 77
c. Number of trials to stabilize judgment	90	5.04	3.83	1 to 12
d. Carry-over of illusion under changed stimulus conditions	90	40.56	9.10	16 to 62
2. Weight Judgment				
a. Total shift in adaptation level	100	14.75	5.53	0 to 25
b. Immediate shift in adaptation level	100	12.57	6.08	1 to 27
c. Maximal shift in adaptation level (converted score)	100	30.70	13.12	10 to 60
d. Variability in adaptation level	100	8.99	3.20	3 to 20
3. Progressive Squares				
a. Inflexibility in readjustment of adapta- tion level	100	17.88	3.84	10 to 31
b. Inconsistency in judgments	100	11.21	4.26	4 to 22
4. Perception of Vertical				
Net displacement toward frame, standing	90	3.6	3.54	-2 to 14
5. Line Movement				
a. Threshold for perceiving horizontal movements in seconds	75	83.50 (med)	---	19 to 180
b. Number of fluctuations in direction	75	22.33	10.72	2 to 52

## Appendix B (Continued)

Variables	N	M	SD	Score Range
6. Periscopic Tracing				
a. Size of square	67	27.63	15.35	10 to 95
b. Distortion of squares	67	39.16	10.81	23 to 81
c. Relational size judgment	67	72.38	15.58	42 to 123
7. Tapping				
a. Neutral tapping rate divided by 10	60	24.50	13.40	6 to 56
b. Slow tapping rate divided by 10	60	5.80	4.25	1 to 23
c. Ratio: slow to fast rate	60	32.45	19.38	4 to 82
8. Kinesthetic After-Effect				
a. Absolute satiation effect	90	29.37	11.43	0 to 74
b. Absolute satiation effect, corrected for position influence	90	17.52	5.07	3 to 36
c. Absolute loss in satiation effect during rest period, corrected for position influence	90	15.87	4.61	2 to 33
d. Position influence (millimeters/2)	90	5.01	3.21	0 to 19
9. Street Gestalt	90	24.16	5.22	11 to 34
10. Gottschaldt Figures	100	9.69	4.90	0 to 20

## APPENDIX C

### Significant Correlations Between Perceptual and Other Assessment Variables

All variables correlating at the five-per-cent level of significance have been listed. Decimal points have been omitted. Row numbers of the variables refer to the ordering in the report by MacKinnon et al (6). The columns represent the perceptual variables; column headings by number and letter as follows:

1. Size-Weight Illusion
  - a. Mean illusion over 12 trials (minus 300, divided by 20)
  - b. Change in illusion from trial 1 to trial 12
  - c. Number of trials to stabilize judgment
  - d. Carry-over of illusion under changed stimulus conditions
2. Weight Judgment: Immediate shift in adaptation level
3. Progressive Squares
  - a. Inflexibility in readjustment of adaptation level
  - b. Inconsistency of judgments
4. Perception of Vertical
5. Line Movement
  - a. Threshold for perceiving horizontal movement
  - b. Number of fluctuations in direction
6. Periscopic Tracing
  - a. Size of Square
  - b. Distortion of square
  - c. Relational size judgment
7. Tapping
  - a. Neutral tapping rate divided by 10
  - b. Slow tapping rate divided by 10
  - c. Ratio: slow to fast rate
8. Kinesthetic After-Effect
  - a. Absolute satiation effect
  - b. Absolute satiation effect, corrected for position-influence
  - c. Absolute loss in satiation effect during rest period, corrected for position influence
  - d. Position influence (millimeters divided by 2)
9. Street Gestalt
10. Gottschaldt Figures

## IPAR VARIABLES

Var No.	Other Assessment Variables	Perceptual Test Variables																				Var No.		
		1a	1b	1c	1d	2	3a	3b	4	5a	5b	6a	6b	6c	7a	7b	7c	8a	8b	8c	8d		9	10
1	SVIB Artist																							1
2	SVIB Psychologist (revised)																							2
3	SVIB Architect																							3
4	SVIB Physician																							4
5	SVIB Osteopath																							5
6	SVIB Mathematician																							6
7	SVIB Physicist																							7
8	SVIB Physicist																							8
9	SVIB Engineer																							9
10	SVIB Chemist																							10
11	SVIB Production manager																							11
12	SVIB Aviator																							12
13	SVIB Printer																							13
14	SVIB Mathematics-physical science teacher																							14
15	SVIB Mathematician																							15
16	SVIB Policeman																							16
17	SVIB YMCA physical director																							17
18	SVIB YMCA administrator																							18
19	SVIB YMCA secretary																							19
20	SVIB Social science high school teacher																							20
21	SVIB City school superintendent																							21
22	SVIB Minister																							22
23	SVIB Musician																							23
24	SVIB Certified public accountant																							24
25	SVIB Office man																							25
26	SVIB Purchasing agent																							26
27	SVIB Mortician																							27
28	SVIB Sales manager																							28
29	SVIB Real estate salesman																							29
30	SVIB Life insurance salesman																							30
31	SVIB Author-journalist																							31
32	SVIB President, manufacturing concern																							32
33	SVIB Interest maturity																							33
34	SVIB Masculinity-femininity																							34
35	SVIB Specialization level																							35
36	SVIB Officer candidate leadership																							36
37	SVIB "Good man" profile correlation																							37
38	CPI Re (social responsibility)																							38
39	CPI To (tolerance)																							39
40	CPI F1 (flexibility)																							40
41	CPI St (capacity for status)																							41
42	CPI Do (dominance)																							42
43	CPI Sp (social participation)																							43
44	CPI De (delinquency)																							44
45	CPI Ie (intellectual efficiency)																							45
46	CPI Ac (academic motivation, high school)																							46
47	CPI Hr (academic motivation, college)																							47
48	CPI Ip (academic motivation, graduate school)																							48
49	CPI Ne (neurodermatitis)																							49
50	CPI Sr (social presence)																							50
51	CPI Im (impulsivity)																							51
52	CPI Sa (self-acceptance)																							52
53	CPI In (infrequency)																							53
54	CPI G1 (good impression)																							54
55	CPI Ds (dissimulation)																							55
56	CPI Co (Original (correctional officers key))																							56
57	CPI Co, Revised (correctional officers key)																							57
58	IPAR Questionnaire: I-IV (general effectiveness)																							58

# Appendix C (Continued)

## IPAR Variables (Continued)

Var No.	Other Assessment Variables	Perceptual Test Variables																							Var No.
		1a	1b	1c	1d	2	3a	3b	4	5a	5b	6a	6b	6c	7a	7b	7c	8a	8b	8c	8d	9	10		
79	IPAR Questionnaire: O-I (originality)																								79
80	IPAR Questionnaire: S (personal soundness)																32								80
82	IPAR Questionnaire: CS (preference for complexity)							-22									27								82
86	IPAR Questionnaire: Ind (capacity for independence)																						23		86
87	IPAR Questionnaire: Mo (military officer effectiveness)					21		-23									31	33							87
90	IPAR Questionnaire: O-3 (research originality: cognitive flexibility)																								90
94	MMPI L (lie)																								94
95	MMPI F (validity)																								95
96	MMPI K (correction) (ego functioning)																								96
98	MMPI Hs (hypochondriasis) (plus .5 K)					21																			98
100	MMPI Hy (hysteria)																								100
101	MMPI Pd (psychopathic deviate) (non-K-corrected)																								101
102	MMPI Pd (psychopathic deviate) (plus .4 K)																								102
103	MMPI Mf (masculinity-femininity)																								103
104	MMPI Pa (paranoia)																								104
105	MMPI Pt (psychasthenia) (non-K-corrected)																								105
106	MMPI Pt (psychasthenia) (plus 1 K)																								106
107	MMPI Sc (schizophrenia) (non-K-corrected)																								107
108	MMPI Sc (schizophrenia) (plus 1 K)																								108
109	MMPI Ma (hypomania) (non-K-corrected)																								109
110	MMPI Ma (hypomania) (plus .2 K)																								110
111	MMPI Si (social introversion)																								111
112	MMPI Si-I (social status potential)																								112
113	MMPI ES (ego-strength)																								113
114	MMPI Lp (leadership)																								114
115	MMPI Sm (self-maintenance)																								115
116	MMPI Rp (role-playing ability)																								116
118	MMPI Lb (low backache)																								118
120	MMPI R (repression) (second-factor scale)																								120
121	MMPI AI (anxiety index)																								121
122	MMPI IR (internalization ratio)																								122
123	MMPI EC (ego-control)																								123
124	MMPI BM (bi-modal ego-control)																								124
125	MMPI F-K (disimulation index)																								125
126	MMPI FF-II (fighter-factor II)																								126
128	MMPI TBD (TB decline)																								128
129	MMPI Mean level of nine clinical scales																								129
131	Gough Adjective Check List: P (potential success)																								131
142	Gough Adjective Check List: Psychological interests																								142
143	Gough Adjective Check List: Self-acceptance ratio																								143
144	Gough Adjective Check List: Self-rejection ratio																								144
147	Gough Adjective Check List: Number of adjectives checked																								147
149	Inventory of Personal Philosophy: Fd (fundamentalist disbelief)																								149
155	Inventory of Personal Philosophy: Ch (chromatic)																								155
156	Inventory of Personal Philosophy: Sog (simple, obliging goodheartedness)																								156
158	Inventory of Personal Philosophy: Rom (romanticism)																								158
160	Bennett Mechanical Comprehension Test, Form BB: Total score																								160
161	Minnesota Paper Form Board: Total score																								161
162	Terman Concept Mastery Test, Form B: Total score																								

Var No.	Other Assessment Variables	Perceptual Test Variables																				Var No.		
		1a	1b	1c	1d	2	3a	3b	4	5a	5b	6a	6b	6c	7a	7b	7c	8a	8b	8c	8d		9	10
176	Word Rearrangement Test: Number of test words used, Part II	-21								29						30								26
177	Word Rearrangement Test: Number of test words used incorrectly, Part II							30							-33									177
178	Word Rearrangement Test: Percentage of test words used which were used incorrectly, Part II					-20		27							-31							-23		178
181	Baron-Welsh Art Scale: Total score																							181
182	Guilford Tests of Creativity: Unusual Uses																							182
183	Guilford Tests of Creativity: Controlled Associations																							183
185	Guilford Tests of Creativity: Consequences, B																							185
187	Guilford Tests of Creativity: Plot Titles, B					-21	-20																	187
188	Guilford Tests of Creativity: Match Problems					-22	-25																	188
189	Guilford Tests of Creativity: Gestalt Transformations					21																		189
190	Guilford Tests of Creativity: Creativity battery, total score																							190
191	Air Force Preference Inventory: Mi (military officer performance)																							191
192	Air Force Preference Inventory: Ia (intellectual aptitude)																							192
193	Air Force Preference Inventory: Cm-I (communality I)																							193
194	Air Force Preference Inventory: Cm-II (communality II)					21																		194
195	Cartoon Test: Me (military efficiency)																							195
196	Cartoon Test: Cy (communality)																							196
198	Cartoon Test: Scholastic motivation																							198
200	Self-Report Test: Physical efficiency																							200
202	Biographical Data Sheets: Self-rating, physical fitness																							202
203	Biographical Data Sheets: Self-rating, physical courage																							203
205	Biographical Data Sheets: Self-rating, physical endurance																							205
206	Biographical Data Sheets: Self-rating, vigor																							206
209	Biographical Data Sheets: Self-rating, rate of recovery from illness																							209
210	Biographical Data Sheets: Self-rating, estimated length of life																							210
211	Biographical Data Sheets: Military effectiveness, estimated rating by peers																							211
213	Biographical Data Sheets: Self-rating, suitability for Air Force career																							213
214	Biographical Data Sheets: Education																							214
215	Biographical Data Sheets: Total Activities Index																							215
219	Composite Variable: "Good Officer" index																							219
220	Field-Testing Composite: Soundness as a person																							220
221	Field-Testing Composite: Intellectual competence																							221
222	Field-Testing Composite: Good judgment																							222
223	Field-Testing Composite: Health and vitality																							223
224	Field-Testing Composite: Military and social presence																							224
226	Field-Testing Composite: Originality																							226
227	Field-Testing Composite: Fair-mindedness																							227
230	Field-Testing Composite: Overall composite																							230
231	Gough Adjective Check List: Test-retest correlation																							231
232	Gough Adjective Check List: Real-self vs. ideal-self correlation																							232
233	Gough Adjective Check List: Total staff checks																							233
234	Gough Adjective Check List: Self-insight I																							234
235	Gough Adjective Check List: Self-insight II																							235
236	Gough Adjective Check List: Judgeability																							236
237	Personal Preference Scale: I K (Kront) prenatal																							237
238	Personal Preference Scale: I G (Grygier) prenatal																							238
239	Personal Preference Scale: II K (Kront) early oral																							239
240	Personal Preference Scale: II A (Grygier) early oral, in terms of oral pleasures																							240
241	Personal Preference Scale: II B (Grygier) early oral, in terms of verbal activity and of emotions and attitudes																							241
242	Personal Preference Scale: II G (Grygier) early oral (II A plus II B)																							242
243	Personal Preference Scale: III K (Kront) late oral																							243
244	Personal Preference Scale: III A (Grygier) late oral, in terms of oral-aggressive drives, not expressed verbally																							244
245	Personal Preference Scale: III B (Grygier) late oral, in terms of verbal behavior and attitudes																							245

# IPAR Variables (Continued)

## Appendix C (Continued)

Var No.	Other Assessment Variables	Perceptual Test Variables																							Var No.
		1a	1b	1c	1d	2	3a	3b	4	5a	5b	6a	6b	6c	7a	7b	7c	8a	8b	8c	8d	9	10		
246	Personal Preference Scale: III G (Grygier) late oral (III A plus III B)	21					29															21	246		
247	Personal Preference Scale: IV K (Krou) early anal																						247		
248	Personal Preference Scale: IV A (Grygier) early anal, expressed in interest in sublimated anal products																					36	248		
249	Personal Preference Scale: IV B (Grygier) early anal, expressed in general behavior																						249		
250	Personal Preference Scale: IV G (Grygier) early anal (IV A plus IV B)																					25	250		
251	Personal Preference Scale: V K (Krou) late anal																					-25	251		
253	Personal Preference Scale: V B (Grygier) late anal, expressed in the degree of self-control, and personality characteristics connected with it																					-23	253		
254	Personal Preference Scale: V G (Grygier) late anal (V A plus V B)																						254		
255	Personal Preference Scale: VI K (Krou) phallic							20														35	255		
256	Personal Preference Scale: VI A (Grygier) phallic, mainly passive, ego-centric-exhibitionistic desire for recognition	-21					21															37	256		
257	Personal Preference Scale: VI B (Grygier) phallic, mainly active, desire for achievement and sublimations of sexual curiosity						25															33	257		
258	Personal Preference Scale: VI G (Grygier) phallic (VI A plus VI B)						25															42	258		
259	Personal Preference Scale: VII K (Krou) feminine identifications						-24	25														29	259		
260	Personal Preference Scale: VII G (Grygier) feminine identifications						21															23	260		
261	Personal Preference Scale: VIII K (Krou) masculine identifications																						261		
262	Personal Preference Scale: VIII G (Grygier) masculine identifications																					21	262		
263	Personal Preference Scale: IX K (Krou) desire to help						-26																263		
264	Personal Preference Scale: IX A (Grygier) desire to help and identification with the weak and the handicapped																						264		
265	Personal Preference Scale: IX B (Grygier) desire to help and identifications with parents and old people						-21	27															265		
266	Personal Preference Scale: IX C (Grygier) desire to help and identifications with children, younger siblings and their substitutes						-30	27														30	266		
267	Personal Preference Scale: IX G (Grygier) desire to help (IX A plus IX B plus IX C)						-25	31															267		
268	Personal Preference Scale: X K (Krou) capacity for mature social relations and for leadership																						268		
269	Personal Preference Scale: X G (Grygier) capacity for mature social relations and for leadership							27															269		
270	University of California Public Opinion Scales: PEC (political and economic conservatism)						21	-20															270		
271	University of California Public Opinion Scales: E (ethnocentrism)						22																271		
272	University of California Public Opinion Scales: F (fascism)																						272		
273	University of California Public Opinion Scales: Public opinion index																						273		
274	IPAR A Priori Scale: Attitudes toward child-rearing																						274		
275	IPAR A Priori Scale: Introspectiveness						-22																275		
276	IPAR A Priori Scale: A priori ego-control																						276		
277	General Information Survey: Total score						-22																277		
278	Kerr Empathy Test: Total score	-22					-22																278		
279	Social Acuity Test: Score on post dictation of real life behavior, judging from films																						279		
280	Social Acuity Test: Score on predicting responses on adjective self-checks, judging from films																						280		
281	Social Acuity Test: Equally weighted composite of the two film-judging variables																						281		
282	Composite Variable: Social judgment, total score																						282		
283	Composite Variable: Social judgment, partial score																						283		
284	Life History Interviewer's Rating: Pathogenicity of childhood																						284		
285	Life History Interviewer's Rating: Ease in interpersonal relations																						285		
286	Life History Interviewer's Rating: Ability to obtain sexual gratification																						286		
287	Life History Interviewer's Rating: Career or work satisfactions																						287		



## IPAR Variables (Continued)

Var No.	Other Assessment Variables	Perceptual Test Variables																Var No.						
		1a	1b	1c	1d	2	3a	3b	4	5a	5b	6a	6b	6c	7a	7b	7c		8a	8b	8c	8d	9	10
288	Life History Interviewer's Rating: Scope as a person																							288
289	Life History Interviewer's Rating: Stability of present adjustment																							289
290	Life History Interviewer's Rating: Moral character (integrity in the ethical sense)																							290
291	Life History Interviewer's Rating: Need for achievement and status																							291
292	Life History Interviewer's Rating: Positive valuation of the military identity																							292
293	Life History Interviewer's Rating: Ego-strength																							293
294	Life History Interview: Age of subject																							294
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296	Life History Interview: Age at first intercourse																							296
297	Medical (physical) Examination and History: Index of apparent youth																							297
298	Medical (physical) Examination and History: Heart rate, normal																							298
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301	Medical (physical) Examination and History: Heart rate, after recovery from exercise																							301
302	Medical (physical) Examination and History: Heart rate, acceleration with exercise																							302
303	Medical (physical) Examination and History: Heart rate, deceleration with recovery from exercise																							303
304	Medical (physical) Examination and History: Systolic pressure, normal																							304
305	Medical (physical) Examination and History: Diastolic pressure, normal																							305
306	Medical (physical) Examination and History: Pulse pressure, normal																							306
307	Medical (physical) Examination and History: Systolic pressure, after exercise																							307
308	Medical (physical) Examination and History: Diastolic pressure, after exercise																							308
309	Medical (physical) Examination and History: Pulse pressure, after exercise																							309
310	Medical (physical) Examination and History: Systolic pressure, after recovery from exercise																							310
311	Medical (physical) Examination and History: Diastolic pressure, after recovery from exercise																							311
315	Medical (physical) Examination and History: Systolic pressure decrease after recovery from exercise																							315
317	Medical (physical) Examination and History: Systolic composite pressure																							317
319	Medical (physical) Examination and History: Weight																							319
320	Medical (physical) Examination and History: Body index																							320
321	Medical (physical) Examination and History: Endomorphy																							321
322	Medical (physical) Examination and History: Mesomorphy																							322
323	Medical (physical) Examination and History: Ectomorphy																							323
324	Thematic Apperception Test: Originality rating																							324
326	Rorschach Psychodiagnostic: M																							326
327	Rorschach Psychodiagnostic: M%																							327
328	Rorschach Psychodiagnostic: FM																							328
329	Rorschach Psychodiagnostic: FM%																							329
330	Rorschach Psychodiagnostic: M plus FM plus m																							330
331	Rorschach Psychodiagnostic: M plus FM plus m%																							331
334	Rorschach Psychodiagnostic: M : FM																							334
335	Rorschach Psychodiagnostic: Ratio of linear derived scores: M : FM																							335
336	Rorschach Psychodiagnostic: Sum C																							336
337	Rorschach Psychodiagnostic: Ratio of linear derived scores: FC : CF/2																							337
338	Rorschach Psychodiagnostic: Number of responses using color																							338
339	Rorschach Psychodiagnostic: Percentage of responses which are color responses																							339
344	Rorschach Psychodiagnostic: P																							344
346	Rorschach Psychodiagnostic: P : 0/5																							346
347	Rorschach Psychodiagnostic: Ratio of linear derived scores: P : 0/2																							347
348	Rorschach Psychodiagnostic: II																							348
349	Rorschach Psychodiagnostic: A																							349
350	Rorschach Psychodiagnostic: W																							350

## Appendix C (Continued)

# IPAR Variables (Continued)

Var No.	Other Assessment Variables	Perceptual Test Variables														Var No.						
		1a	1b	1c	1d	2	3a	3b	4	5a	5b	6a	6b	7a	7b		7c	8a	8b	8c	8d	9
351	Rorschach Psychodiagnostic: W%				27					-23												351
352	Rorschach Psychodiagnostic: D				-26					25												352
353	Rorschach Psychodiagnostic: D%				-30																	353
354	Rorschach Psychodiagnostic: 100 minus (W% plus D%)	-21							-22	27												354
355	Rorschach Psychodiagnostic: Number of different determinants used																				31	355
356	Rorschach Psychodiagnostic: Rejections																		-21			356
357	Rorschach Psychodiagnostic: Total number of responses				-31					-25												357
359	Rorschach Concept Evaluation Test: X-score																					359
361	Test for Perception of Human Movement in Inkblots: Threshold A																					361
362	Test for Perception of Human Movement in Inkblots: Threshold B																					362
363	Test for Perception of Human Movement in Inkblots: Volume of M produced																					363
364	Size-Weight Illusion Test: Magnitude of illusion on trial 1																					364
365	Size-Weight Illusion Test: Magnitude of illusion on trial 24																					365
366	Size-Weight Illusion Test: Change in illusion, trial 1 to trial 12																					366
370	Size-Weight Illusion Test: Carry-over of illusion under changed stimulus conditions																					370
371	Weight Judgment Test: Total shift in adaptation level				-28																	371
373	Weight Judgment Test: Maximal shift in adaptation level																					373
374	Weight Judgment Test: Variability in adaptation level																					374
375	Progressive Squares Test: Adaptation level, initial phase																					375
376	Progressive Squares Test: Adaptation level, final phase																					376
378	Progressive Squares Test: Inaccuracy of shift in adaptation level																					378
380	Progressive Squares Test: Inaccuracy of judgments, middle phase																					380
384	Progressive Squares Test: Inconsistency of judgments																					384
385	Perception of Vertical Test: Total error, standing erect																					385
386	Perception of Vertical Test: Total error, sitting tilted																					386
387	Perception of Vertical Test: Relative effect of body tilt																					387
388	Perception of Vertical Test: Error, sitting tilted, frame tilted to opposite side																					388
389	Perception of Vertical Test: Error, sitting tilted, frame tilted to same side																					389
390	Perception of Vertical Test: Total displacement toward frame, standing erect																					390
391	Perception of Vertical Test: Total displacement toward frame, sitting tilted																					391
393	Perception of Vertical Test: Displacement toward frame, sitting tilted, frame tilted to same side																					393
394	Line Movement Test: Number of fluctuations in direction																					394
395	Line Movement Test: Total time in horizontal phase																					395
396	Line Movement Test: Average duration of horizontal phase																					396
398	Periscopic Tracing Test: Size of square																					398
400	Periscopic Tracing Test: Angular error, tilted square																					400
401	Periscopic Tracing Test: Angular error of vertical line																					401
402	Periscopic Tracing Test: Relational size judgment: 6½" square "distant" compared with 13" square "distant"																					402
406	Tapping Test: Fast tapping rate																					406
407	Tapping Test: Neutral tapping rate																					407
410	Tapping Test: Ratio: slow to fast rate																					410
411	Tapping Test: Relation of slow, neutral, and fast rates																					411
412	Kinesthetic After-Effect Test: Control judgment																					412
414	Kinesthetic After-Effect Test: Relative satiation effect, first period																					414
416	Kinesthetic After-Effect Test: Relative satiation effect, two periods combined																					416
417	Kinesthetic After-Effect Test: Absolute satiation effect, first period																					417
419	Kinesthetic After-Effect Test: Absolute satiation effect, two periods combined																					419
420	Kinesthetic After-Effect Test: Absolute loss in satiation effect during rest period																					420
421	Kinesthetic After-Effect Test: Relative loss in satiation effect during rest period																					421
424	Kinesthetic After-Effect Test: Absolute satiation effect, first period, corrected for position influence																					424
425	Kinesthetic After-Effect Test: Absolute satiation effect, second period, corrected for position influence																					425
426	Kinesthetic After-Effect Test: Absolute satiation effect, both periods combined, corrected for position influence																					426

## Appendix C (Continued)

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# IPAR Variables (Continued)

Var No.	Other Assessment Variables	Perceptual Test Variables															Var No.							
		1a	1b	1c	1d	2	3a	3b	4	5a	5b	6a	6b	7a	7b	7c		8a	8b	8c	8d	9	10	
503	Composite Variable: Originality																							26
504	Staff Evaluation, Q-Sort Item: Derives personal reward and pleasure from his work; values productive achievement for its own sake.	-23					-24																	504
505	Staff Evaluation, Q-Sort Item: Has high degree of intellectual ability.																							505
506	Staff Evaluation, Q-Sort Item: Is an effective leader.						-24														25			506
507	Staff Evaluation, Q-Sort Item: Emphasizes success and productive achievement as a means for achieving status, power and recognition.												-27							-32				507
510	Staff Evaluation, Q-Sort Item: Has a narrow range of interests.																							510
511	Staff Evaluation, Q-Sort Item: Gets along well in the world as it is; is socially appropriate in his behavior; keeps out of trouble. (N.B. to be considered as conceptually separate from the subject's internal psychic state.)	-21																		22	-26	-26		511
512	Staff Evaluation, Q-Sort Item: Has slow personal tempo; responds, speaks and moves slowly.																							512
513	Staff Evaluation, Q-Sort Item: Is socially perceptive; responsive to interpersonal nuances.																			24				513
514	Staff Evaluation, Q-Sort Item: Is a conscientious, responsible, dependable person.																							514
515	Staff Evaluation, Q-Sort Item: Manipulates people as a means to achieving personal ends; opportunistic; sloughs over the meaning and value of the individual.	-21																						515
516	Staff Evaluation, Q-Sort Item: Is active and vigorous.																							516
517	Staff Evaluation, Q-Sort Item: Is competitive with his peers; likes to be ahead and win.																			-24				517
518	Staff Evaluation, Q-Sort Item: Takes an ascendant role in his relations with others.																							518
519	Staff Evaluation, Q-Sort Item: Is introspective; concerned with his self as object; frequently self-aware. (N.B. do not confuse with neuroticism.)																			-29				519
520	Staff Evaluation, Q-Sort Item: Is rigid; inflexible in thought and action.																							520
521	Staff Evaluation, Q-Sort Item: Efficient, capable, able to mobilize resources easily and effectively; not bothered with work inhibitions.																							521
522	Staff Evaluation, Q-Sort Item: Allows personal bias, spite or dogmatism to enter into his judgment of issues.																							522
523	Staff Evaluation, Q-Sort Item: Lacks social poise and presence; becomes rattled and upset in social situations.																							523
524	Staff Evaluation, Q-Sort Item: Is stereotyped and unoriginal in his approach to problems.						20																	524
525	Staff Evaluation, Q-Sort Item: Is verbally fluent; conversationally facile.																							525
526	Staff Evaluation, Q-Sort Item: Prefers action to contemplation.																							526
527	Staff Evaluation, Q-Sort Item: With respect to authority, is submissive, compliant and overly accepting.																							527
529	Staff Evaluation, Q-Sort Item: Has the ability to draw dependable and practical inferences; common sense; good judgment.																							529
530	Staff Evaluation, Q-Sort Item: Would become confused, disorganized and unadaptive under stress.																							530
531	Staff Evaluation, Q-Sort Item: Tends to side-step troublesome situations; makes concessions to avoid unpleasantness.																			25				531
533	Staff Evaluation, Q-Sort Item: Is persistent in working toward his goal.																							533
534	Staff Evaluation, Q-Sort Item: Lacks confidence in his own ability.																			-24				534
535	Staff Evaluation, Q-Sort Item: Highly catbects intellectual activity; values cognitive pursuits.																			26				535
536	Staff Evaluation, Q-Sort Item: Tends to arouse hostility and resentment in other people.																							536
539	Staff Evaluation, Q-Sort Item: Has a good sense of humor.																							539
540	Staff Evaluation, Q-Sort Item: Lacks insight into his own motives and behavior.																							540
541	Staff Evaluation, Q-Sort Item: Identifies with the values, actions, attitudes, etc., of his professional group.																							541

## IPAR Variables (Continued)

Var No.	Other Assessment Variables	Perceptual Test Variables																Var No.						
		1a	1b	1c	1d	2	3a	3b	4	5a	5b	6a	6b	6c	7a	7b	7c		8a	8b	8c	8d	9	10
542	Staff Evaluation, Q-Sort Item: Is masculine in his style and manner of behavior.																							
543	Staff Evaluation, Q-Sort Item: Is pessimistic about his own professional future and advancement.							-20										31				-26		
545	Staff Evaluation, Q-Sort Item: Is unable to make decisions without vacillation, hesitation or delay.																	29				-25		
547	Staff Evaluation, Q-Sort Item: Fears possible future privation; anticipates being exploited and cheated.							24						27								-35		
548	Staff Evaluation, Q-Sort Item: Under-controls his impulses; acts with insufficient thinking and deliberation; unable to delay gratification.												-25											
549	Staff Evaluation, Q-Sort Item: Is self-reliant; independent in judgment; able to think for himself.												-32											
550	Staff Evaluation, Q-Sort Item: Is self-abusing; feels unworthy, guilty, humble; given to self-blame.																23							
551	Staff Evaluation, Q-Sort Item: Is self-defensive; rationalizes, excuses, blames.												26											
552	Staff Evaluation, Q-Sort Item: Is gregarious; prefers inter-personal and group situations to intra-personal circumstances; seeks relatedness to others.							-22	26				29											
553	Staff Evaluation, Q-Sort Item: Over-controls his impulses; is inhibited; needlessly delays or denies gratification.							22																
555	Staff Evaluation, Q-Sort Item: Seeks and enjoys aesthetic and sensuous impressions.				-25								-36										22	
556	Staff Evaluation, Q-Sort Item: Is frank and candid in his relations with others.																							
557	Staff Evaluation, Q-Sort Item: Is influenced in his behavior by diffuse personal feelings and intangible and subjective facts.		-21		-23								25											
559	Staff Evaluation, Q-Sort Item: Is pedantic and fussy about minor things.																						-20	
561	Staff Evaluation, Q-Sort Item: Is turned to for advice and reassurance; fatherly.		-26																				-25	
562	Staff Evaluation, Q-Sort Item: Apt to be misunderstood by others.																	-25						
563	Staff Evaluation, Q-Sort Item: Takes the initiative in social relations.																	27					-27	
565	Staff Evaluation, Q-Sort Item: Tends not to become involved in things; passively resistant.																							
569	Staff Evaluation, Q-Sort Item: Emphasizes oral pleasure; self-indulgent.				-23																			
571	Staff Evaluation, Q-Sort Item: Is counteractive in the face of frustration.																-34							
572	Staff Evaluation, Q-Sort Item: Is concerned with making a good impression.														-30									
573	Staff Evaluation, Q-Sort Item: Is concerned with philosophical problems; e.g., religion, values, the meaning of life, etc.																					25		
574	Staff Evaluation, Q-Sort Item: Communicates ideas clearly and effectively.						-21															29		
575	Staff Evaluation, Q-Sort Item: Is rebellious toward authority figures, rules and other constraints.		24																					
576	Staff Evaluation, Q-Sort Item: Tends to be ostentatious and exhibitionistic.																	-27						
577	Staff Evaluation, Q-Sort Item: Is unaware of his social stimulus value.																					-21		
578	Staff Evaluation, Q-Sort Item: Is at odds with himself; has major internal conflicts.																							
581	Staff Evaluation, Rating: Ability to communicate																	-23				25	23	
582	Staff Evaluation, Rating: Adaptive flexibility													-30								21	27	
583	Staff Evaluation, Rating: Breadth of interests													-27								26	35	
584	Staff Evaluation, Rating: Constriction																					-25		
585	Staff Evaluation, Rating: Dominance													-23				-23				24		
586	Staff Evaluation, Rating: Drive																	-27				-24		
587	Staff Evaluation, Rating: Evaluation of ideas													-25								21	29	
588	Staff Evaluation, Rating: Fluency of ideas																	-29				28	29	
589	Staff Evaluation, Rating: Fairmindedness													-27								24		
590	Staff Evaluation, Rating: Good judgment																					25	27	
592	Staff Evaluation, Rating: Impulsivity																					-21		
594	Staff Evaluation, Rating: Intellectual competence																					27	35	
595	Staff Evaluation, Rating: Leadership																					30		
596	Staff Evaluation, Rating: Likeability																					-32	-24	
598	Staff Evaluation, Rating: Military and social presence																					28	32	
599	Staff Evaluation, Rating: Naturalness																	-21				28		

## Appendix C (Continued)

**IPAR Variables (Continued)**

### Appendix C (Continued)

Var No.	Other Assessment Variables										Perceptual Test Variables										Var No.	
	1a	1b	1c	1d	2	3a	3b	4	5a	5b	6a	6b	7a	7b	7c	8a	8b	8c	8d	9		10
500	Staff Evaluation, Rating: Originality																					
501	Staff Evaluation, Rating: Personal courage																					
502	Staff Evaluation, Rating: Positive valuation of the military identity																					
503	Staff Evaluation, Rating: Rigidity																					
504	Staff Evaluation, Rating: Self-confidence																					
505	Staff Evaluation, Rating: Self-defensiveness																					
506	Staff Evaluation, Rating: Self-insight																					
507	Staff Evaluation, Rating: Soundness as a person																					
508	Staff Evaluation, Rating: Verbal fluency																					
509	Staff Evaluation, Rating: Over-all military effectiveness in command functions																					
510	Staff Evaluation, Rating: Over-all military effectiveness in staff functions																					
511	Composite Evaluation: Anxiety rating																					
512	Composite Evaluation: Intelligence																					
513	Graphological Ranking: Family adjustment																					
514	Graphological Ranking: Social adjustment																					
517	Graphological Ranking: Leadership ability																					
518	Graphological Ranking: Absolutism																					
520	Graphological Ranking: Emotional stability																					
521	Graphological Ranking: Intelligence																					
522	Field Test Composites, Cluster A: Effective intelligence																					
523	Field Test Composites, Cluster B: Military leadership																					
524	Field Test Composites, Cluster C: Functional soundness																					
525	Field Test Composites, Cluster A: Effective intelligence																					
527	Staff Ratings, Cluster A: Effective leadership																					
528	Intellectual Efficiency Factor Score: Verbal intelligence																					
529	Intellectual Efficiency Factor Score: Spatial ability																					
530	Intellectual Efficiency Factor Score: Problem solving ability																					
531	Intellectual Efficiency Factor Score: Phenotypic intelligence																					
532	Officer Effectiveness Report Ratings (OER): 1. Job knowledge																					
534	Officer Effectiveness Report Ratings (OER): 3. Judgment																					
535	Officer Effectiveness Report Ratings (OER): 4. Reliability and personal responsibility																					
536	Officer Effectiveness Report Ratings (OER): 5. Leadership																					
537	Officer Effectiveness Report Ratings (OER): 6. Growth potential																					
538	Officer Effectiveness Report Ratings (OER): 7. Over-all evaluation																					
539	Promotion Board Ratings (mean of three boards) (PHB)																					
540	Superior Officers' Ratings, Factor Score I: General effectiveness																					
542	Superior Officers' Ratings, Factor Score III: Conscientiousness																					
543	Job-Concept Interview Ratings, Cluster Score I and 2: Work effectiveness and responsibility																					
544	Job-Concept Interview Ratings, Cluster Score 1: Work effectiveness																					
545	Job-Concept Interview Ratings, Cluster Score 2: Responsibility																					
546	Job-Concept Interview Ratings, Cluster Score 3: Human relations skills																					
548	Criterion Composite: Criterion index																					

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